

STATE OF CALIFORNIA  
DEPARTMENT OF TRANSPORTATION

**NOTICE TO BIDDERS  
AND  
SPECIAL PROVISIONS**

**FOR CONSTRUCTION ON STATE HIGHWAY IN THE CITY AND COUNTY OF  
SAN FRANCISCO FROM THE YERBA BUENA TUNNEL TO 1.3 KM EAST OF THE  
YERBA BUENA TUNNEL**

**In District 04 On Route 80**

**Under**

---

**Bid book dated April 9, 2012**

**Standard Specifications dated 1999**

**Project Plans approved February 21, 2012**

**Standard Plans dated 2004**

---

**Identified by**

**Contract No. 04-0120T4**

**04-SF-80-12.6/13.9**

**Project ID 0400000027**

**Electronic Advertising Contract**

Bids open Tuesday, September 25, 2012  
Dated April 9, 2012

OSD  
IH



\*\*\*\*\*

# SPECIAL NOTICES

\*\*\*\*\*

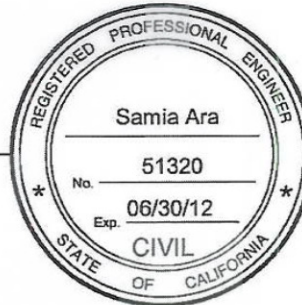
- Effective July 6, 2010, the Department will receive bids for projects in Districts 1 through 6, 9, and 10 at 1727 30th Street, Bidders' Exchange, MS 26, Sacramento, CA 95816. Refer to the Notice to Bidders for this project's bid opening date, time, and location.
- The Department has changed its DVBE requirements. Refer to section titled "Disabled Veteran Business Enterprises" in Section 2, "Bidding," of these special provisions.
- The Department is providing an electronic Information Handout for this project. Refer to Section 2-1.03B, "Supplemental Project Information," in the Amendments to the Standard Specifications for the location of this information.
- The bidder's attention is directed to "Submittals with Bid", "Pre-Award Qualifications Review, and "Pre-Award Qualifications Questionnaire," of these special provisions.
- Attention is directed to Section 4, "Beginning of Work, Time of Completion and Liquidated Damages," of the special provisions regarding special requirements for beginning of work and revised definition of "working day."
- The bidder's attention is also directed to "Designated Portion of Work" in Section 4, "Beginning of Work, Time of Completion and Liquidated Damages," of the special provisions regarding Cost + Time Bidding on completion of installation of the bike path.
- See Section 2, "Bidding" of the Special Provisions, regarding a mandatory Pre-Bid Meeting and Networking-Outreach Session, and project site tour to submit bids for this project.
- The contract award period has been extended for this project.
- The Department is allowing contractors to submit electronic payroll records to the District Labor Compliance Office. Refer to section titled "Electronic Submission of Payroll Records" under Section 5, "General," of these special provisions.

## CONTRACT NO. 04-0120T4

The special provisions contained herein  
have been prepared by or under the  
direction of the following Registered Persons.

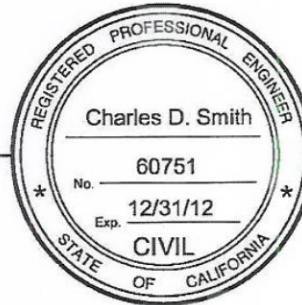
### MATERIAL

Samia Ara 01/23/2012  
REGISTERED CIVIL ENGINEER



### ENVIRONMENTAL ENGINEERING

Charles D. Smith Jan 20, 2012  
REGISTERED CIVIL ENGINEER



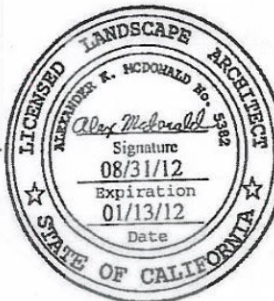
### WATER POLLUTION CONTROL

Analette Ochoa 1/20/12  
REGISTERED CIVIL ENGINEER



### EROSION CONTROL

Alex McDonald  
LICENSED LANDSCAPE ARCHITECT



## CONTRACT NO. 04-0120T4

The special provisions contained herein  
have been prepared by or under the  
direction of the following Registered Persons.

### HIGHWAY

H. K. Tay 01/24/12  
REGISTERED CIVIL ENGINEER



### HIGHWAY

Mark Grodzki 1/24/12  
REGISTERED CIVIL ENGINEER



### GEOTECHNICAL

S. M. Mohan  
REGISTERED CIVIL ENGINEER



### LANDSCAPE

Lorena Wong  
LICENSED LANDSCAPE ARCHITECT

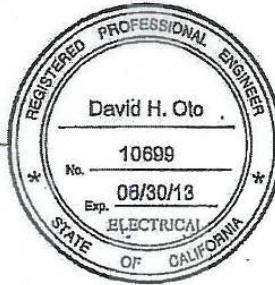


# CONTRACT NO. 04-0120T4

The special provisions contained herein  
have been prepared by or under the  
direction of the following Registered Persons.

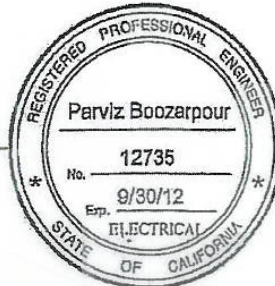
## ELECTRICAL

David H. Oto 1/24/12  
REGISTERED ELECTRICAL ENGINEER



## ELECTRICAL

Parviz Boozarpour 1/24/12  
REGISTERED ELECTRICAL ENGINEER



## STRUCTURES

Steve Margaris  
REGISTERED CIVIL ENGINEER



## STRUCTURES

Laura Rubalcaba  
REGISTERED CIVIL ENGINEER



# TABLE OF CONTENTS

NOTICE TO BIDDERS .....	1
COPY OF BID ITEM LIST .....	3
SPECIAL PROVISIONS .....	17
SECTION 1. (BLANK).....	17
SECTION 2. BIDDING .....	17
2-1.01 ESCROW OF BID DOCUMENTATION.....	17
2-1.02 MANDATORY PREBID MEETING AND SITE TOUR .....	19
2-1.03 SUBMITTALS WITH BID .....	19
2-1.04 PRE-AWARD QUALIFICATIONS QUESTIONNAIRE.....	20
2-1.05 SMALL BUSINESS AND NON-SMALL BUSINESS SUBCONTRACTOR PREFERENCES .....	20
2-1.06 DISABLED VETERAN BUSINESS ENTERPRISES.....	21
2-1.07 CALIFORNIA COMPANIES .....	22
2-1.08 TIE BID RESOLUTION .....	22
2-1.09 OPT OUT OF PAYMENT ADJUSTMENTS FOR PRICE INDEX FLUCTUATIONS .....	22
SECTION 3. CONTRACT AWARD AND EXECUTION .....	22
3-1.01 PRE-AWARD QUALIFICATIONS REVIEW .....	22
3-1.02 CONTRACT AWARD.....	23
3-1.03 SMALL BUSINESS PARTICIPATION REPORT .....	23
SECTION 4. BEGINNING OF WORK, TIME OF COMPLETION, AND LIQUIDATED DAMAGES .....	23
SECTION 5. GENERAL.....	24
5-1.01 EMISSIONS REDUCTION .....	24
5-1.02 NON-SMALL BUSINESSES .....	24
5-1.03 DISABLED VETERAN BUSINESS ENTERPRISES.....	25
5-1.04 PARTNERING DISPUTE RESOLUTION .....	25
5-1.05 PAYMENT ADJUSTMENTS FOR PRICE INDEX FLUCTUATIONS .....	25
5-1.06 SURFACE MINING AND RECLAMATION ACT.....	29
5-1.07 ELECTRONIC SUBMISSION OF PAYROLL RECORDS .....	29
5-1.08 RETENTION EXCLUSION .....	30
5-1.09 WORKING DRAWINGS .....	30
5-1.10 FORCE ACCOUNT PAYMENT.....	31
5-1.11 TIDAL CONDITIONS AND ELEVATION DATUM.....	32
5-1.12 PAYMENTS .....	32
5-1.13 SUPPLEMENTAL PROJECT INFORMATION .....	33
INFORMATION HANDOUT .....	33
INFORMATION AVAILABLE FOR INSPECTION .....	35
5-1.14 INTEGRATED SHOP DRAWINGS .....	35
5-1.15 COST REDUCTION INCENTIVE PROPOSALS .....	37
5-1.16 SOUND CONTROL REQUIREMENTS.....	38
5-1.17 SPECIES PROTECTION .....	39
5-1.18 BIRD PROTECTION PLAN.....	40
5-1.19 BIRD PROTECTION.....	41
5-1.20 RELATIONS WITH CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD.....	41
5-1.21 RELATIONS WITH SAN FRANCISCO BAR PILOTS .....	42
5-1.22 RELATIONS WITH UNITED STATES COAST GUARD.....	42
5-1.23 ENVIRONMENTALLY SENSITIVE AREAS .....	44
A. ENVIRONMENTALLY SENSITIVE AREAS .....	44
B. AREA TO BE MONITORED (ATM) .....	45
C. SPECIAL CONSTRUCTION AREA (SCA) .....	45
5-1.24 PRESERVE HISTORICAL BUILDINGS .....	46
5-1.25 NONHIGHWAY FACILITIES (INCLUDING UTILITIES).....	46
5-1.26 TUNNEL SAFETY ORDERS .....	47
5-1.27 AREAS FOR CONTRACTOR'S USE .....	47
5-1.28 UTILITIES.....	50
5-1.29 SANITARY PROVISIONS .....	50
5-1.30 BRIDGE TOLLS.....	50



5-1.31 ACCESS TO PROJECT SITE .....	50
5-1.32 PERMITS, LICENSES, AGREEMENTS, AND CERTIFICATIONS .....	50
5-1.33 PHOTO IDENTIFICATION SYSTEM .....	51
5-1.34 RESPONSIBILITY TO OTHERS .....	53
SECTION 6. (BLANK) .....	53
SECTION 7. (BLANK) .....	53
SECTION 8. MATERIALS .....	53
SECTION 8-1. MISCELLANEOUS .....	53
8-1.01 SUBSTITUTION OF NON-METRIC MATERIALS AND PRODUCTS .....	53
8-1.02 PREQUALIFIED AND TESTED SIGNING AND DELINEATION MATERIALS .....	60
8-1.03 STATE-FURNISHED MATERIALS .....	66
8-1.04 ENGINEERING FABRICS .....	66
SECTION 8-2. CONCRETE .....	66
8-2.01 PORTLAND CEMENT CONCRETE .....	66
8-2.02 CORROSION CONTROL FOR PORTLAND CEMENT CONCRETE .....	67
8-2.03 PRECAST CONCRETE QUALITY CONTROL .....	67
SECTION 8-3. WELDING .....	70
8-3.01 WELDING .....	70
WELDING QUALITY CONTROL .....	72
WELDING FOR OVERHEAD SIGN AND POLE STRUCTURES .....	75
STEEL PIPE PILING QUALIFICATION AUDIT .....	75
SECTION 9. DESCRIPTION OF BRIDGE WORK .....	76
SECTION 10. CONSTRUCTION DETAILS .....	77
SECTION 10-1. GENERAL .....	77
10-1.01 ORDER OF WORK .....	77
10-1.02 HEALTH AND SAFETY PLAN .....	79
10-1.03 TURBIDITY CONTROL .....	79
10-1.04 DEWATERING AND NON-STORM WATER DISCHARGE CONTROL .....	85
10-1.05 WORKING DRAWING SUBMITTAL SCHEDULE .....	90
10-1.06 CONTRACTOR SUPPLIED BIOLOGIST .....	91
10-1.07 WATER POLLUTION CONTROL .....	93
10-1.08 CONSTRUCTION SITE MANAGEMENT .....	107
10-1.09 TEMPORARY FIBER ROLL .....	117
10-1.10 TEMPORARY CONSTRUCTION ENTRANCE .....	119
10-1.11 STREET SWEEPING .....	121
10-1.12 TEMPORARY HYDRAULIC MULCH (BONDED FIBER MATRIX) .....	122
10-1.13 TEMPORARY COVER .....	125
10-1.14 TEMPORARY CONCRETE WASHOUT (PORTABLE) .....	126
10-1.15 TEMPORARY CHECK DAM .....	128
10-1.16 TEMPORARY FIBER ROLL .....	130
10-1.17 TEMPORARY SILT FENCE .....	132
10-1.18 TEMPORARY FENCE .....	133
10-1.19 TEMPORARY FENCE (TYPE ESA) .....	134
10-1.20 TEMPORARY GRAVEL BAG BERM .....	135
10-1.21 TEMPORARY CONSTRUCTION ENTRANCE .....	136
10-1.22 MOVE-IN/MOVE-OUT (TEMPORARY EROSION CONTROL) .....	138
10-1.23 TEMPORARY DRAINAGE INLET PROTECTION .....	139
10-1.24 ESTABLISH MARINE ACCESS .....	148
10-1.25 MARINE PILE DRIVING ENERGY ATTENUATOR .....	149
10-1.26 SHORING TOWERS .....	152
10-1.27 TEMPORARY SUPPORTS (CANTILEVER TRUSS) .....	153
TEMPORARY SUPPORT DESIGN AND DRAWINGS .....	153
TEMPORARY SUPPORT DESIGN CRITERIA .....	154
SPECIAL LOCATIONS .....	154
TEMPORARY SUPPORT CONSTRUCTION .....	154
REMOVING TEMPORARY SUPPORTS .....	155
10-1.28 SCAFFOLDING .....	155
10-1.29 COOPERATION .....	156
10-1.30 PHOTO SURVEY/PUBLIC RELATIONS .....	156



10-1.31	TRANSPORTATION FOR THE ENGINEER .....	156
10-1.32	ENGINEER'S INSPECTION FACILITY .....	158
10-1.33	BIDDERS COMPENSATION.....	158
10-1.34	DOCUMENT MANAGEMENT SYSTEM ELECTRONIC DATA DELIVERY .....	159
10-1.35	PROGRESS SCHEDULE (CRITICAL PATH METHOD) .....	159
10-1.36	TIME-RELATED OVERHEAD.....	165
10-1.37	EMERGENCY ACCESS ROAD CONTINGENCY PLAN .....	167
10-1.38	TEMPORARY SHUTTLE VAN SERVICE .....	168
10-1.39	CONSTRUCTION AREA TRAFFIC CONTROL DEVICES .....	168
10-1.40	CONSTRUCTION AREA SIGNS .....	169
10-1.41	DUST CONTROL.....	170
10-1.42	MAINTAINING TRAFFIC .....	170
10-1.43	CLOSURE REQUIREMENTS AND CONDITIONS.....	176
10-1.44	IMPACT ATTENUATOR VEHICLE .....	177
10-1.45	TRAFFIC CONTROL SYSTEM FOR LANE CLOSURE .....	178
	STATIONARY LANE CLOSURE.....	179
	MOVING LANE CLOSURE.....	179
	PAYMENT .....	180
10-1.46	TEMPORARY PAVEMENT DELINEATION (ROUTE 80).....	180
10-1.47	TEMPORARY PAVEMENT DELINEATION .....	181
10-1.48	BARRICADE.....	184
10-1.49	PORTABLE CHANGEABLE MESSAGE SIGNS.....	184
10-1.50	TEMPORARY RAILING.....	185
10-1.51	CHANNELIZER.....	185
10-1.52	TEMPORARY CRASH CUSHION MODULE.....	185
10-1.53	EXISTING HIGHWAY FACILITIES .....	187
	EXISTING PAINT SYSTEMS.....	187
	REMOVE PIPE LINE.....	191
	SALVAGE BASKETBALL HOOP .....	191
	SALVAGE PARKING CANOPY .....	191
	SALVAGE WOODEN GATE.....	192
	REMOVE METAL BEAM GUARD RAILING .....	192
	REMOVE PAVEMENT MARKER .....	192
	REMOVE TRAFFIC STRIPE AND PAVEMENT MARKING .....	192
	REMOVE DRAINAGE FACILITY .....	192
	REMOVE ROADSIDE SIGN .....	192
	REMOVE FIRE ALARM POST .....	192
	REMOVE FENCE .....	192
	RECONSTRUCT CANTILEVER SWING GATE (TYPE METAL) .....	192
	RECONSTRUCT TIMBER STAIR .....	193
	RESET ROADSIDE SIGN .....	193
	RELOCATE ROADSIDE SIGN.....	193
	ADJUST INLET .....	194
	REMOVE BASE AND SURFACING.....	194
	COLD PLANE ASPHALT CONCRETE PAVEMENT.....	194
	ADJUST FRAME AND COVER TO GRADE (DUCT BANK MANHOLE).....	195
	BRIDGE REMOVAL .....	195
	REMOVE EPOXY ASPHALT CONCRETE SURFACING .....	197
	REMOVE CONCRETE DECK SURFACE .....	198
	PREPARE CONCRETE BRIDGE DECK SURFACE.....	199
	REMOVE CONCRETE.....	199
	REMOVE CONCRETE VAULT .....	200
	REMOVE METAL STAIR.....	200
	RELOCATE PREFABRICATED BOOTH.....	200
	REMOVE CONCRETE BARRIER (TYPE K) .....	200
	REMOVE SOLDIER PILE WALL .....	201
	REMOVE SOIL NAIL WALL (PORTION) .....	201
	REMOVE FALSEWORK TOWER .....	201
	RECONSTRUCT PEDESTRIAN TURNSTILE .....	202

MEASUREMENT AND PAYMENT .....	202
REMOVE HYDRANT.....	202
RELOCATE HYDRANT.....	202
10-1.54 WASH DOWN BUILDING .....	203
10-1.55 REMOVE GUARD BOOTH AND CANOPY .....	203
10-1.56 REMOVE BOOTH.....	204
10-1.57 SAMPLING AND REMOVAL OF ASBESTOS-CONTAINING MATERIAL.....	205
10-1.58 BRIDGE REMOVAL, PORTION (CANTILEVER TRUSS) .....	208
10-1.59 JACK BRIDGE .....	210
10-1.60 REMOVE YELLOW TRAFFIC STRIPE AND PAVEMENT MARKING (HAZARDOUS WASTE) .....	212
10-1.61 TREATED WOOD WASTE .....	214
10-1.62 VIBRATION MONITORING.....	216
10-1.63 PHOTO SURVEY OF EXISTING FACILITIES .....	219
10-1.64 SEWER VIDEO SURVEY .....	221
10-1.65 CLEARING AND GRUBBING.....	224
10-1.66 EARTHWORK .....	224
SOLDIER PILE WALL EARTHWORK.....	225
GEOCOMPOSITE DRAIN.....	226
TEMPORARY SHORING.....	227
STRUCTURE BACKFILL (BRIDGE) (CEMENT MODIFIED) .....	229
10-1.67 HANDLING, TRANSPORTATION, AND DISPOSAL OF CONTAMINATED MATERIAL .....	229
10-1.68 GEOSYNTHETIC REINFORCED EMBANKMENT.....	232
EMBANKMENT BACKFILL.....	234
CONSTRUCTION .....	234
MEASUREMENT AND PAYMENT.....	235
10-1.69 EMBANKMENT CONFINEMENT SYSTEM.....	235
10-1.70 EROSION CONTROL (SEQUENCING) .....	239
10-1.71 EROSION CONTROL (NETTING) .....	240
10-1.72 EROSION CONTROL (WIRE MESH BLANKET) .....	241
MEASUREMENT AND PAYMENT.....	244
10-1.73 MOVE-IN/MOVE-OUT (EROSION CONTROL) .....	244
10-1.74 EROSION CONTROL (TYPE D).....	245
10-1.75 EROSION CONTROL (COMPOST BLANKET).....	248
10-1.76 FIBER ROLLS .....	250
10-1.77 TOPSOIL .....	251
10-1.78 IRRIGATION CROSSOVERS .....	252
10-1.79 IRRIGATION SLEEVE .....	252
10-1.80 TRANSPLANT PALM TREES .....	252
10-1.81 WATER METER .....	254
10-1.82 AGGREGATE SUBBASE.....	254
10-1.83 AGGREGATE BASE.....	255
10-1.84 HOT MIX ASPHALT .....	255
10-1.85 MINOR HOT MIX ASPHALT .....	256
10-1.86 PRIME COAT .....	256
10-1.87 JOINTED PLAIN CONCRETE PAVEMENT.....	257
10-1.88 PILING.....	262
CAST-IN-DRILLED-HOLE CONCRETE PILES .....	266
STEEL PIPE PILING.....	278
STEEL SOLDIER PILING .....	281
10-1.89 DRILLED HOLES .....	282
10-1.90 PRESTRESSING CONCRETE.....	283
10-1.91 TIEBACK ANCHORS.....	283
MATERIALS .....	284
CONSTRUCTION .....	285
MEASUREMENT AND PAYMENT.....	288
10-1.92 GROUTING .....	288
10-1.93 CONCRETE STRUCTURES.....	288
DECK CRACK TREATMENT .....	289
DECK SURFACE TEXTURE.....	289

SELF-CONSOLIDATING CONCRETE.....	289
MASS CONCRETE.....	291
FALSEWORK .....	294
COST REDUCTION INCENTIVE PROPOSAL FOR CAST-IN-PLACE.....	295
PRESTRESSED BOX GIRDER BRIDGES.....	295
ELASTOMERIC BEARING PADS .....	296
MEASUREMENT AND PAYMENT.....	297
10-1.94 PRECAST CONCRETE SLAB (BIKE PATH).....	297
PAYMENT .....	298
10-1.95 PTFE SPHERICAL BEARING .....	298
10-1.96 BIKE PATH EXPANSION JOINT.....	300
NONSKID SURFACE.....	301
MEASUREMENT AND PAYMENT.....	301
10-1.97 STRUCTURE APPROACH SLABS (TYPE EQ (3) MOD) .....	301
10-1.98 DRILL AND BOND DOWELS .....	303
10-1.99 CORE CONCRETE .....	304
10-1.100 ROADWAY LIGHT POLE FOUNDATION (BRIDGE) .....	304
10-1.101 SEALING JOINTS .....	304
10-1.102 JOINT SEAL ASSEMBLIES (MAXIMUM MOVEMENT RATING, 100 MM).....	304
ALTERNATIVE JOINT SEAL ASSEMBLY .....	305
10-1.103 INSTALL MODULAR JOINT SEAL ASSEMBLY.....	306
MANUFACTURER.....	306
WORKING DRAWINGS.....	306
STORAGE, TRANSPORTATION, AND HANDLING.....	307
INSTALLATION.....	307
MEASUREMENT AND PAYMENT.....	308
10-1.104 POLYESTER CONCRETE OVERLAY .....	308
10-1.105 ARCHITECTURAL SURFACE (TEXTURED CONCRETE).....	313
TEST PANEL .....	313
FORM LINERS .....	313
RELEASING FORM LINERS .....	314
ABRASIVE BLASTING .....	314
CURING .....	314
MEASUREMENT AND PAYMENT.....	314
10-1.106 REINFORCEMENT .....	314
EPOXY-COATED PREFABRICATED REINFORCEMENT .....	315
MEASUREMENT AND PAYMENT.....	316
10-1.107 HEADED BAR REINFORCEMENT .....	316
GENERAL .....	316
PRODUCTION TESTS .....	317
MEASUREMENT AND PAYMENT.....	318
10-1.108 ERECT STATE-FURNISHED BIKEPATH AT PIER W2.....	318
10-1.109 DIRECTIONAL SIGN.....	319
10-1.110 ROADSIDE SIGNS .....	319
10-1.111 FURNISH SIGN .....	320
SHEET ALUMINUM.....	321
RETROREFLECTIVE SHEETING .....	321
PROCESS COLOR AND FILM.....	322
SINGLE SHEET ALUMINUM SIGN.....	322
FIBERGLASS REINFORCED PLASTIC PANEL SIGN.....	322
LAMINATED PANEL SIGN.....	323
FORMED PANEL SIGN .....	324
MEASUREMENT AND PAYMENT.....	324
10-1.112 TIMBER LAGGING.....	324
10-1.113 CLEAN AND PAINT MISCELLANEOUS FACILITIES.....	324
10-1.114 CLEAN AND PAINT STEEL SOLDIER PILING.....	330
10-1.115 CLEAN AND PAINT JOINT SEAL ASSEMBLIES, PTFE BEARINGS AND RESTRAINER UNITS (BAR TYPE) .....	333
10-1.116 ALTERNATIVE PIPE.....	336

10-1.117 PLASTIC PIPE.....	336
10-1.118 REINFORCED CONCRETE PIPE .....	336
10-1.119 CORRUGATED METAL PIPE .....	336
10-1.120 COLUMN ISOLATION PIPE.....	336
MEASUREMENT AND PAYMENT .....	337
10-1.121 UNDERDRAIN.....	337
10-1.122 MISCELLANEOUS FACILITIES.....	337
10-1.123 DRAINAGE INLET MARKER .....	337
10-1.124 POLYVINYL CHLORIDE SEWER PIPE.....	338
10-1.125 SLOPE PROTECTION .....	338
10-1.126 GABIONS (POLYVINYL CHLORIDE COATED) .....	338
10-1.127 MISCELLANEOUS CONCRETE CONSTRUCTION.....	342
10-1.128 MISCELLANEOUS METAL (BRIDGE).....	343
10-1.129 BRIDGE DECK DRAINAGE SYSTEM .....	343
10-1.130 MISCELLANEOUS METAL (RESTRAINER-CABLE TYPE) .....	344
10-1.131 MISCELLANEOUS METAL (RESTRAINER-BAR TYPE) .....	344
10-1.132 TYPE METAL FENCE .....	344
10-1.133 CHAIN LINK FENCE (TYPE CL-1.8) .....	345
10-1.134 CHAIN LINK FENCE (TYPE CL-1.2, BLACK VINYL-CLAD).....	345
10-1.135 CHAIN LINK FENCE (TYPE CL-1.8, BLACK VINYL CLAD WITH EXTENSION ARM) .....	345
10-1.136 CHAIN LINK FENCE AND GATE (TYPE CL-1.8, BLACK VINYL-CLAD).....	346
10-1.137 CHAIN LINK FENCE AND GATE (TYPE CL-3.6, BLACK VINYL CLAD) .....	346
10-1.138 CHAIN LINK FENCE AND GATE (TYPE CL-2.4, BLACK VINYL CLAD WITH EXTENSION ARM).....	346
10-1.139 CANTILEVER SWING GATE (TYPE CL-2.4, BLACK VINYL-CLAD WITH EXTENSION ARM)...	346
10-1.140 CANTILEVER SWING GATE (TYPE METAL).....	348
10-1.141 BIKE PATH FENCE .....	348
10-1.142 BIKE PATH RAILING .....	348
10-1.143 IN-GROUND TRAFFIC SPIKE .....	349
10-1.144 METAL BEAM GUARD RAILING.....	349
ALTERNATIVE FLARED TERMINAL SYSTEM.....	349
10-1.145 PARKING BUMPER .....	350
10-1.146 MARKERS AND DELINEATORS .....	351
10-1.147 BOLLARD .....	351
10-1.148 REMOVABLE BOLLARD.....	352
10-1.149 PEDESTRIAN RAILING .....	353
10-1.150 CONCRETE BARRIER.....	353
10-1.151 ALTERNATIVE CRASH CUSHION.....	354
10-1.152 THERMOPLASTIC TRAFFIC STRIPE AND PAVEMENT MARKING .....	355
10-1.153 PAVEMENT MARKERS .....	356
10-1.154 BENCH AND TRASH RECEPTACLE .....	356
10-1.155 BASKETBALL AND VOLLEYBALL COURT .....	357
10-1.156 INSTALL FIRE HYDRANT.....	359
10-1.157 WATER MAINS .....	359
10-1.158 GAS PIPE.....	365
MEASUREMENT.....	366
PAYMENT.....	366
SECTION 10-2. (BLANK).....	366
SECTION 10-3. SIGNALS, LIGHTING AND ELECTRICAL SYSTEMS.....	367
10-3.01 DESCRIPTION .....	367
10-3.02 ABBREVIATIONS.....	368
10-3.03 COST BREAK-DOWN.....	369
10-3.04 MAINTAINING EXISTING AND TEMPORARY ELECTRICAL SYSTEMS .....	370
10-3.05 MAINTAINING EXISTING TRAFFIC MANAGEMENT SYSTEM ELEMENTS DURING CONSTRUCTION .....	371
10-3.06 CAST-IN-DRILLED-HOLE CONCRETE PILE FOUNDATIONS (AT GRADE).....	372
10-3.07 CAST-IN-DRILLED-HOLE CONCRETE PILE FOUNDATIONS (UNITED STATES COAST GUARD).....	373
10-3.08 CONSTRUCTION RESPONSIBILITY.....	373

10-3.09 CONDUIT.....	374
10-3.10 UNDERGROUND RACEWAYS.....	375
10-3.11 SUPPORT HARDWARE FOR CONDUITS, CABLE TRAYS AND WIREWAYS .....	375
10-3.12 PULL BOXES, SPLICE BOXES AND JUNCTION BOXES .....	377
10-3.13 CONDUCTORS, CABLES AND WIRING.....	378
15 kV CABLE.....	379
CLOSED CIRCUIT TELEVISION CABLES.....	381
10-3.14 SEISMIC ANCHORING .....	383
10-3.15 BONDING AND GROUNDING .....	384
10-3.16 SERVICE.....	384
THREE PHASE MANUALLY OPERATED LOAD-INTERRUPTING FUSED SWITCH ASSEMBLY.....	387
10-3.17 STRUCTURE GROUNDING .....	390
10-3.18 ELECTRICAL EQUIPMENT IDENTIFICATION AND LABELING.....	390
10-3.19 STATE-FURNISHED 7 METER LIGHT POLE AND FIXTURE .....	391
10-3.20 STATE-FURNISHED 3.5 METER BIKE PATH BELVEDERE LIGHT POLE AND FIXTURE.....	392
10-3.21 STATE-FURNISHED BIKEPATH LANDING LIGHT POLE AND FIXTURE.....	392
10-3.22 STATE-FURNISHED CONTROLLER ASSEMBLIES .....	393
10-3.23 TRAFFIC OPERATIONS SYSTEM .....	393
10-3.24 FIBER OPTIC SYSTEM .....	393
10-3.25 CIRCUIT BREAKER TYPE B .....	412
10-3.26 CLOSEOUT SUBMITTALS .....	412
10-3.27 SOFFIT LUMINAIRES .....	412
10-3.28 PHOTOELECTRIC CONTROLS.....	412
10-3.29 SITE SECURITY .....	412
10-3.30 ACCESS CONTROL SYSTEM .....	415
10-3.31 GROUND RETRACTABLE (ACTIVE) VEHICLE BARRIER .....	418
10-3.32 DISPOSING OF ELECTRICAL EQUIPMENT .....	422
10-3.33 REMOVING, REINSTALLING OR SALVAGING ELECTRICAL EQUIPMENT.....	422
10-3.34 PAYMENT .....	423
SECTION 11. (BLANK).....	424
SECTION 12. BUILDING WORK.....	424
SECTION 12-1. GENERAL REQUIREMENTS.....	424
12-1.01 SCOPE .....	424
12-1.02 ABBREVIATIONS .....	424
12-1.03 GUARANTEE .....	425
12-1.04 AREAS FOR CONTRACTOR'S USE.....	425
12-1.05 COOPERATION .....	425
12-1.06 SUBMITTALS.....	425
12-1.07 PROGRESS SCHEDULE.....	426
12-1.08 SCHEDULE OF VALUES .....	426
12-1.09 INSPECTION .....	426
12-1.10 OBSTRUCTIONS .....	426
12-1.11 PRESERVATION OF PROPERTY .....	427
12-1.12 UTILITY CONNECTION .....	427
12-1.13 TEMPORARY UTILITIES .....	427
12-1.14 SANITARY FACILITIES .....	427
12-1.15 MEASUREMENT AND PAYMENT.....	428
12-1.16 PROJECT RECORD DRAWINGS.....	428
12-1.17 FIELD ENGINEERING.....	428
12-1.18 SUBSTITUTION OF NON-METRIC MATERIALS AND PRODUCTS .....	429
SECTION 12-2. SITEWORK .....	439
12-2.01 CLEARING AND GRUBBING .....	439
12-2.02 EARTHWORK FOR BUILDING WORK.....	440
12-2.03 FREE DRAINING GRANULAR MATERIAL .....	443
12-2.04 CAST-IN-DRILLED-HOLE CONCRETE PILES .....	443
SECTION 12-3. CONCRETE AND REINFORCEMENT .....	444
12-3.01 CAST-IN-PLACE CONCRETE .....	444
12-3.02 DRILL AND BOND DOWELS .....	451
12-3.03 EPOXY GROUT .....	451

SECTION 12-4. MASONRY .....	452
12-4.01 CONCRETE MASONRY UNITS.....	452
SECTION 12-5. METALS .....	455
12-5.01 STRUCTURAL STEEL FOR BUILDINGS .....	455
12-5.02 OPEN WEB STEEL JOISTS.....	458
12-5.03 METAL DECK .....	460
12-5.04 COLD FORMED METAL FRAMING .....	462
12-5.05 BUILDING MISCELLANEOUS METAL .....	464
12-5.06 STAIR NOSING .....	467
SECTION 12-6. WOOD AND PLASTICS .....	468
12-6.01 CABINETS .....	468
SECTION 12-7. THERMAL AND MOISTURE PROTECTION .....	469
12-7.01 INSULATION (GENERAL).....	469
12-7.02 RIGID ROOF INSULATION.....	470
12-7.03 COMPOSITE PANELS .....	472
12-7.04 SHEET METAL FLASHING.....	478
12-7.05 TORCH APPLIED ROOFING.....	480
12-7.06 JOINT SEALANT.....	482
12-7.07 SEALANTS AND CAULKING.....	483
SECTION 12-8. DOORS AND WINDOWS .....	484
12-8.01 HINGED DOORS .....	484
12-8.02 ACCESS DOORS .....	485
12-8.03 WINDOWS .....	486
12-8.04 FINISH HARDWARE .....	487
12-8.05 GLAZING .....	490
SECTION 12-9. FINISHES.....	492
12-9.01 RESILIENT BASE.....	492
12-9.02 EPOXY FLOOR TOPPING .....	492
12-9.03 PAINTING.....	494
12-9.04 SUSPENDED CEILINGS .....	499
SECTION 12-10. SPECIALTIES.....	500
12-10.01 SIGNS .....	500
12-10.02 TOILET AND SHOWER ACCESSORIES.....	500
SECTION 12-11. (BLANK).....	502
SECTION 12-12. (BLANK).....	502
SECTION 12-13. (BLANK).....	502
SECTION 12-14. (BLANK).....	502
SECTION 12-15. MECHANICAL.....	502
12-15.01 MECHANICAL WORK .....	502
12-15.02 PIPE, FITTINGS AND VALVES .....	503
12-15.03 MECHANICAL INSULATION .....	513
12-15.04 PLUMBING FIXTURES .....	515
12-15.05 HEATING, VENTILATING AND AIR CONDITIONING EQUIPMENT AND SYSTEMS .....	517
SECTION 12-16. ELECTRICAL .....	519
12-16.01 ELECTRICAL WORK.....	519
12-16.02 BASIC MATERIALS AND METHODS .....	520
12-16.03 ELECTRICAL EQUIPMENT.....	526
12-16.04 LIGHTING .....	529
12-16.05 LIGHT EMITTING DIODE SIGNAL MODULE.....	532
AMENDMENTS TO THE STANDARD SPECIFICATIONS .....	537

# STANDARD PLANS LIST

The Standard Plan sheets applicable to this contract include, but are not limited to, those indicated below. Applicable Revised Standard Plans (RSP) and New Standard Plans (NSP) indicated below are included in the project plans as Standard Plan sheets.

A10A	Acronyms and Abbreviations (A-L)
A10B	Acronyms and Abbreviations (M-Z)
A10C	Symbols (Sheet 1 of 2)
A10D	Symbols (Sheet 2 of 2)
A20A	Pavement Markers and Traffic Lines, Typical Details
A20B	Pavement Markers and Traffic Lines, Typical Details
A20C	Pavement Markers and Traffic Lines, Typical Details
A20D	Pavement Markers and Traffic Lines, Typical Details
A24A	Pavement Markings - Arrows
A24B	Pavement Markings - Arrows
RSP A24C	Pavement Markings – Symbols and Numerals
A24D	Pavement Markings – Words
A24E	Pavement Markings – Words and Crosswalks
A62A	Excavation and Backfill – Miscellaneous Details
A62B	Limits of Payment for Excavation and Backfill – Bridge Surcharge and Wall
A62C	Limits of Payment for Excavation and Backfill - Bridge
A62D	Excavation and Backfill – Concrete Pipe Culverts
A62F	Excavation and Backfill – Metal and Plastic Culverts
A73A	Object Markers
A73B	Markers
A73C	Delineators, Channelizers and Barricades
RSP A76A	Concrete Barrier Type 60
A76B	Concrete Barrier Type 60
A76G	Concrete Barrier Type 60S
A76H	Concrete Barrier Type 60S
A77A1	Metal Beam Guard Railing – Standard Railing Section (Wood Post with Wood Block)
A77B1	Metal Beam Guard Railing – Standard Hardware
A77C1	Metal Beam Guard Railing – Wood Post and Wood Block Details
A77C3	Metal Beam Guard Railing – Typical Line Post Embedment and Hinge Point Offset Details
A77E1	Metal Beam Guard Railing – Typical Layouts for Embankments
A77E2	Metal Beam Guard Railing – Typical Layouts for Embankments
A77E3	Metal Beam Guard Railing – Typical Layouts for Embankments
A77E4	Metal Beam Guard Railing – Typical Layouts for Embankments
A77E5	Metal Beam Guard Railing – Typical Layouts for Embankments
A77E6	Metal Beam Guard Railing – Typical Layouts for Embankments
A77L1	Metal Beam Railing Terminal System (Type SRT)
A77L5	Metal Beam Railing Terminal System (Type FLEAT)
A82B1	Crash Cushion (Type ADIEM)
A82D1	Crash Cushion (Type React 9SCBS)



RSP A82D2	Crash Cushion (Type React 9SCBS) – Connection To Concrete Barrier
A82D3	Crash Cushion (Type React 9SCBS) – Alignment Offset Details
A85	Chain Link Fence
A86	Barbed Wire And Wire Mesh Fences
RSP A87A	Curbs and Driveways
A87B	Asphalt Concrete Dikes
RSP A88A	Curb Ramp Details
RSP A88B	Curb Ramp and Island Passageway Details
RSP A90A	Accessible Parking – Off-Street
RSP P1	Jointed Plain Concrete Pavement
RSP P20	Concrete Pavement – Joint Details
D72	Drainage Inlets
D73	Drainage Inlets
D74A	Drainage Inlets
D74B	Drainage Inlets
D74C	Drainage Inlets Details
RSP D77A	Grate Details
D77B	Bicycle Proof Grate Details
D78A	Gutter Depressions
RSP D78C	Inlet Depressions – Asphalt Concrete Shoulders
D94A	Metal and Plastic Flared End Sections
D94B	Concrete Flared End Sections
D97A	Corrugated Metal Pipe Coupling Details No. 1- Annular Coupling Band Bar And Strap and Angle Connections
D97C	Corrugated Metal Pipe Coupling Details No. 3- Helical and Universal Couplers
D97D	Corrugated Metal Pipe Coupling Details No. 4- Hugger Coupling Bands
RSP D97F	Corrugated Metal Pipe Coupling Details No. 6- Positive Joint
D97H	Reinforced Concrete Pipe or Non-Reinforced Concrete Pipe-Standard and Positive Joints
NSP D97I	Corrugated Polyvinyl Chloride Pipe with Smooth Interior – Standard and Positive Joints
D100A	Gabion Basket Details No. 1
D100B	Gabion Basket Details No. 2
D102	Underdrains
H1	Planting and Irrigation – Abbreviations
RSP H2	Planting and Irrigation – Symbols
H9	Planting and Irrigation Details
NSP H51	Erosion Control Details (Fiber Roll)
RSP T1A	Temporary Crash Cushion, Sand Filled (Unidirectional)
RSP T1B	Temporary Crash Cushion, Sand Filled (Bidirectional)
RSP T2	Temporary Crash Cushion, Sand Filled (Shoulder Installations)
T3	Temporary Railing (Type K)
RSP T10	Traffic Control System for Lane Closure on Freeways and Expressways
RSP T13	Traffic Control System for Lane Closure on Two Lane Conventional Highways
RSP T14	Traffic Control System for Ramp Closure
T51	Temporary Water Pollution Control Details (Temporary Silt Fence)
T53	Temporary Water Pollution Control Details (Temporary Cover)

T55	Temporary Water Pollution Control Details (Temporary Erosion Control Blanket)
T56	Temporary Water Pollution Control Details (Temporary Fiber Roll)
T57	Temporary Water Pollution Control Details (Temporary Check Dam)
T58	Temporary Water Pollution Control Details (Temporary Construction Entrance)
B0-1	Bridge Details
B0-3	Bridge Details
B0-5	Bridge Details
B0-13	Bridge Details
B3-1	Retaining Wall Type 1 – H=1200 Through 9100 mm
B3-3	Retaining Wall Type 1A
B3-7	Retaining Wall Type 5
B3-8	Retaining Wall Details No. 1
B3-9	Retaining Wall Details No. 2
B3-11	Retaining Wall Type 6 – 1829 mm Maximum
RSP B6-21	Joint Seals (Maximum Movement Rating = 50 mm)
B7-1	Box Girder Details
B7-5	Deck Drains
B7-6	Deck Drains – Types D-1 and D-2
B7-8	Deck Drainage Details
B7-10	Utility Opening – Box Girder
B7-11	Utility Details
RSP B8-5	Cast-In-Place Prestressed Girder Details
B11-55	Concrete Barrier Type 732
B14-3	Communication and Sprinkler Control Conduits (Conduit Less Than Size 103)
RS1	Roadside Signs, Typical Installation Details No. 1
RS2	Roadside Signs - Wood Post, Typical Installation Details No. 2
RS4	Roadside Signs, Typical Installation Details No. 4
RSP ES-1A	Electrical Systems (Symbols And Abbreviations)
RSP ES-1B	Electrical Systems (Symbols And Abbreviations)
RSP ES-1C	Electrical Systems (Symbols And Abbreviations)
RSP ES-2C	Electrical Systems (Service Equipment Notes, Type III Series)
RSP ES-2D	Electrical Systems (Service Equipment and Typical Wiring Diagram, Type III – A Series)
RSP ES-2F	Electrical Systems (Service Equipment and Typical Wiring Diagram Type III – C Series)
ES-3A	Electrical Systems (Controller Cabinet Details)
RSP ES-3C	Electrical Systems (Controller Cabinet Details)
ES-4A	Electrical Systems (Signal Heads and Mountings)
RSP ES-4D	Electrical Systems (Signal Heads and Mountings)
RSP ES-5A	Electrical Systems (Detectors)
RSP ES-5D	Electrical Systems (Detectors)
RSP ES-6A	Electrical Systems (Lighting Standard Types 15 and 21)
RSP ES-7B	Electrical Systems (Signal And Lighting Standard – Type 1 Standard and Equipment Numbering)
RSP ES-7M	Electrical Systems (Signal and Lighting Standards – Details No. 1)
ES-7N	Electrical Systems (Signal and Lighting Standards – Details No. 2)
RSP ES-8	Electrical Systems (Pull Box Details)

RSP ES-9C	Electrical Systems (Electrical Details, Structure Installations)
ES-9E	Electrical Systems (Electrical Details, Structure Installations)
RSP ES-11	Electrical Systems (Foundation Installations)
RSP ES-13A	Electrical Systems (Splicing Details)
RSP ES-13B	Electrical Systems (Wiring Details and Fuse Ratings)
RSP ES-15D	Electrical Systems (Lighting and Sign Illumination Control)

# NOTICE TO BIDDERS

Bids open Tuesday, September 25, 2012

Dated April 9, 2012

General work description: Construct Bridge, Roadways, Electrical, Buildings and Remove Bridges.

The Department will receive sealed bids for CONSTRUCTION ON STATE HIGHWAY IN THE CITY AND COUNTY OF SAN FRANCISCO FROM THE YERBA BUENA TUNNEL TO 1.3 KM EAST OF THE YERBA BUENA TUNNEL.

District-County-Route-Kilometer Post: 04-SF-80-12.6/13.9

Contract No. 04-0120T4

The Contractor must have either a Class A license or a combination of Class C licenses which constitutes a majority of the work.

The Department establishes no DVBE Contract goal but encourages bidders to obtain DVBE participation.

Bids must be on cost + time basis for the Designated Portion of Work.

Complete the Designated Portion of Work within the number of working days bid. Do not bid more than 1030 working days for the Designated Portion of Work.

Complete all work within the number of working days bid plus 180 working days.

The estimated cost of the project is \$114,000,000.

A mandatory prebid meeting is scheduled for this project at 10:00am, on May 10, 2012, at Treasure Island, Casa De La Vista, 271 Avenue of the Palms, San Francisco, CA 94130.

The Department will receive bids until 2:00 p.m. on the bid open date at 1727 30th Street, Bidders' Exchange, MS 26, Sacramento, CA 95816. Bids received after this time will not be accepted. Department staff will direct the bidders to the bid opening.

The Department will open and publicly read the bids at the above location immediately after the specified closing time.

District office addresses are provided in the Standard Specifications.

Present bidders' inquiries to the Department and view the Department's responses at:

[http://www.dot.ca.gov/hq/esc/oe/project\\_status/bid\\_inq.html](http://www.dot.ca.gov/hq/esc/oe/project_status/bid_inq.html)

Questions about alleged patent ambiguity of the plans, specifications, or estimate must be asked before bid opening. After bid opening, such questions will not be treated as bid protests.

Submit your bid with bidder's security equal to at least 10 percent of the bid.

Under Govt Code § 14835 et seq. and 2 CA Code of Regs § 1896 et seq., the Department gives preference to certified small businesses and non-small businesses who commit to 25 percent certified small business participation.

Under Pub Cont Code § 6107, the Department gives a reciprocal preference to a California company for bid comparison purposes over a nonresident contractor from any state that provides a preference to contractors from that state on construction contracts.

Prevailing wages are required on this Contract. The Director of the California Department of Industrial Relations determines the general prevailing wage rates. Obtain the wage rates at the DIR Web site, <http://www.dir.ca.gov>, or from the Department's Labor Compliance Office of the district in which the work is located.

The Department has made available Notices of Suspension and Proposed Debarment from the Federal Highway Administration. For a copy of the notices go to [http://www.dot.ca.gov/hq/esc/oe/contractor\\_info](http://www.dot.ca.gov/hq/esc/oe/contractor_info). Additional information is listed in the Excluded Parties List System at <https://www.epls.gov>.

DEPARTMENT OF TRANSPORTATION

AOO

### COPY OF BID ITEM LIST

Item No.	Item Code	Item Description	Unit of Measure	Estimated Quantity
1	043670	ESTABLISH MARINE ACCESS	LS	LUMP SUM
2	070012	PROGRESS SCHEDULE (CRITICAL PATH METHOD)	LS	LUMP SUM
3	022834	DOCUMENT DATA MANAGEMENT SYSTEM ELECTRONIC DATA DELIVERY	LS	LUMP SUM
4	070018	TIME-RELATED OVERHEAD	LS	LUMP SUM
5	022835	CONTRACTOR SUPPLIED BIOLOGIST	LS	LUMP SUM
6	022836	TRANSPORTATION FOR ENGINEER	LS	LUMP SUM
7	022837	ENGINEER'S INSPECTION FACILITY	LS	LUMP SUM
8	022838	TEMPORARY SHUTTLE VAN	LS	LUMP SUM
9	022839	TEMPORARY FENCE (TYPE CL-2.4, BLACK VINYL- CLAD WITH BARBED WIRE EXTENSION ARM)	M	480
10	071325	TEMPORARY FENCE (TYPE ESA)	M	1,530
11	043671	SHORING TOWERS	LS	LUMP SUM
12	074016	CONSTRUCTION SITE MANAGEMENT	LS	LUMP SUM
13	074018	HEALTH AND SAFETY PLAN	LS	LUMP SUM
14	074019	PREPARE STORM WATER POLLUTION PREVENTION PLAN	LS	LUMP SUM
15	022840	TURBIDITY CONTROL	LS	LUMP SUM
16	074022	DEWATERING AND NON-STORM WATER DISCHARGE CONTROL	LS	LUMP SUM
17	074028	TEMPORARY FIBER ROLL	M	8,230
18	074029	TEMPORARY SILT FENCE	M	2,720
19	074031	TEMPORARY GRAVEL BAG BERM	M	1,700
20	074033	TEMPORARY CONSTRUCTION ENTRANCE	EA	8

Item No.	Item Code	Item Description	Unit of Measure	Estimated Quantity
21	074034	TEMPORARY COVER	M2	4,050
22	074035	TEMPORARY CHECK DAM	M	200
23	074037	MOVE-IN/MOVE-OUT (TEMPORARY EROSION CONTROL)	EA	12
24	074038	TEMPORARY DRAINAGE INLET PROTECTION	EA	92
25	074040	TEMPORARY HYDRAULIC MULCH (BONDED FIBER MATRIX)	M2	27,500
26	074041	STREET SWEEPING	LS	LUMP SUM
27	074042	TEMPORARY CONCRETE WASHOUT (PORTABLE)	LS	LUMP SUM
28	074056	RAIN EVENT ACTION PLAN	EA	90
29	074057	STORM WATER ANNUAL REPORT	EA	3
30	074058	STORM WATER SAMPLING AND ANALYSIS DAY	EA	210
31	120090	CONSTRUCTION AREA SIGNS	LS	LUMP SUM
32	120100	TRAFFIC CONTROL SYSTEM	LS	LUMP SUM
33	120120	TYPE III BARRICADE	EA	28
34	120161	TEMPORARY TRAFFIC STRIPE	M	3,260
35	120165	CHANNELIZER (SURFACE MOUNTED)	EA	95
36	129000	TEMPORARY RAILING (TYPE K)	M	290
37	129100	TEMPORARY CRASH CUSHION MODULE	EA	25
38	150605	REMOVE FENCE	M	30
39	150608	REMOVE CHAIN LINK FENCE	M	580
40	150620	REMOVE GATE	EA	6



Item No.	Item Code	Item Description	Unit of Measure	Estimated Quantity
41	150662	REMOVE METAL BEAM GUARD RAILING	M	200
42	150668	REMOVE FLARED END SECTION	EA	2
43	141103	REMOVE YELLOW THERMOPLASTIC TRAFFIC STRIPE (HAZARDOUS WASTE)	M	360
44	150714	REMOVE THERMOPLASTIC TRAFFIC STRIPE	M	1,480
45	150722	REMOVE PAVEMENT MARKER	EA	490
46	150744	REMOVE ROADSIDE SIGN (WOOD POST)	EA	1
47	022842	REMOVE FALSEWORK TOWER	LS	LUMP SUM
48	150805	REMOVE CULVERT	M	630
49	022843	REMOVE FIBER OPTIC CALBE	M	360
50	022844	REMOVE FIRE ALARM POST	EA	1
51	022845	REMOVE CONCRETE VAULT	EA	1
52	022846	REMOVE METAL STAIR	EA	1
53	150820	REMOVE INLET	EA	27
54	022847	REMOVE SOIL NAIL WALL (PORTION)	M	23
55	022848	REMOVE SOLDIER PILE WALL	M	110
56	150841	REMOVE SEWER PIPE	M	260
57	022849	REMOVE WATER PIPE	M	270
58	022850	REMOVE GAS PIPE	M	84
59	022851	REMOVE EPOXY ASPHALT CONCRETE SURFACING	M2	3,370
60	150860	REMOVE BASE AND SURFACING	M3	420

Item No.	Item Code	Item Description	Unit of Measure	Estimated Quantity
61	150870	REMOVE CONCRETE DECK SURFACE	M2	244
62	022852	RELOCATE PREFABRICATED BOOTH	LS	LUMP SUM
63	022853	SALVAGE PARKING CANOPY	LS	LUMP SUM
64	022854	SALVAGE BASKETBALL HOOP	EA	1
65	022855	SALVAGE WOODEN GATE	EA	1
66	022856	RECONSTRUCT CANTILEVER SWING GATE (TYPE METAL)	EA	1
67	022857	RECONSTRUCT TIMBER STAIR	LS	LUMP SUM
68	152320	RESET ROADSIDE SIGN	EA	1
69	152351	RELOCATE HYDRANT	EA	1
70	022858	RECONSTRUCT PEDESTRIAN TURNSTILE	EA	1
71	152390	RELOCATE ROADSIDE SIGN	EA	9
72	022859	SEWER VIDEO SURVEY	LS	LUMP SUM
73	022860	VIBRATION MONITOR	LS	LUMP SUM
74	022861	PHOTO SURVEY OF EXISTING FACILITY	LS	LUMP SUM
75	152430	ADJUST INLET	EA	4
76	152440	ADJUST MANHOLE TO GRADE	EA	6
77	022862	REMOVE HYDRANT	EA	1
78	153103	COLD PLANE ASPHALT CONCRETE PAVEMENT	M2	1,370
79	153210	REMOVE CONCRETE	M3	370
80	153225	PREPARE CONCRETE BRIDGE DECK SURFACE	M2	4,735

Item No.	Item Code	Item Description	Unit of Measure	Estimated Quantity
81	153229	REMOVE CONCRETE BARRIER (TYPE K)	M	910
82	156585	REMOVE CRASH CUSHION	EA	2
83	156590	REMOVE CRASH CUSHION (SAND FILLED)	EA	1
84	022863	ASBESTOS INSPECTION (BRIDGE REMOVAL)	LS	LUMP SUM
85	157561	BRIDGE REMOVAL (PORTION), LOCATION A	LS	LUMP SUM
86	157562	BRIDGE REMOVAL (PORTION), LOCATION B	LS	LUMP SUM
87	157563	BRIDGE REMOVAL (PORTION), LOCATION C	LS	LUMP SUM
88	157564	BRIDGE REMOVAL (PORTION), LOCATION D	LS	LUMP SUM
89	157565	BRIDGE REMOVAL (PORTION), LOCATION E	LS	LUMP SUM
90	157566	BRIDGE REMOVAL (PORTION), LOCATION F	LS	LUMP SUM
91	157567	BRIDGE REMOVAL (PORTION), LOCATION G	LS	LUMP SUM
92	157568	BRIDGE REMOVAL (PORTION), LOCATION H	LS	LUMP SUM
93	043672	JACK BRIDGE	LS	LUMP SUM
94	160101	CLEARING AND GRUBBING	LS	LUMP SUM
95	022864	REMOVE GUARD BOOTH AND CANOPY	LS	LUMP SUM
96	022865	REMOVE BOOTH	LS	LUMP SUM
97	190101	ROADWAY EXCAVATION	M3	37,800
98	190110	LEAD COMPLIANCE PLAN	LS	LUMP SUM
99	190113	ASBESTOS COMPLIANCE PLAN	LS	LUMP SUM
100	022866	ROADWAY EXCAVATION (TYPE H)	M3	1,690

Item No.	Item Code	Item Description	Unit of Measure	Estimated Quantity
101 (F)	192003	STRUCTURE EXCAVATION (BRIDGE)	M3	2,075
102 (F)	192037	STRUCTURE EXCAVATION (RETAINING WALL)	M3	2,537
103 (F)	192049	STRUCTURE EXCAVATION (SOLDIER PILE WALL)	M3	77
104 (F)	193003	STRUCTURE BACKFILL (BRIDGE)	M3	945
105 (F)	043673	STRUCTURE BACKFILL (BRIDGE) (CEMENT MODIFIED)	M3	610
106 (F)	193013	STRUCTURE BACKFILL (RETAINING WALL)	M3	1,456
107 (F)	193029	STRUCTURE BACKFILL (SOLDIER PILE WALL)	M3	189
108 (F)	193116	CONCRETE BACKFILL (SOLDIER PILE WALL)	M3	572
109	198250	GEOSYNTHETIC REINFORCEMENT	M2	7,470
110	022867	EMBANKMENT CONFINEMENT SYSTEM	M3	9,280
111	203002	EROSION CONTROL (COMPOST BLANKET)	M3	650
112	022868	EROSION CONTROL (TYPE D)	M2	29,500
113	022869	EROSION CONTROL (NETTING)	M2	14,300
114	203021	FIBER ROLLS	M	3,330
115	203026	MOVE-IN/MOVE-OUT (EROSION CONTROL)	EA	8
116	022870	EROSION CONTROL (WIRE MESH BLANKET)	M2	1,390
117	204031	TRANSPLANT PALM TREE	LS	LUMP SUM
118	022871	25 MM WATER GALVANIZED STEEL PIPE	M	7
119	022872	300 MM WATER DUCTILE IRON PIPE	M	350
120	208304	WATER METER	EA	3

Item No.	Item Code	Item Description	Unit of Measure	Estimated Quantity
121	208310	IRRIGATION SLEEVE	M	52
122	208731	200 MM CORRUGATED HIGH DENSITY POLYETHYLENE PIPE CONDUIT	M	330
123	250401	CLASS 4 AGGREGATE SUBBASE	M3	2,250
124	260201	CLASS 2 AGGREGATE BASE	M3	68
125	260301	CLASS 3 AGGREGATE BASE	M3	5,700
126	390132	HOT MIX ASPHALT (TYPE A)	TONN	6,840
127	390161	HOT MIX ASPHALT (BRIDGE)	TONN	9
128	394073	PLACE HOT MIX ASPHALT DIKE (TYPE A)	M	48
129	043674	PLACE HOT MIX ASPHALT (BRIDGE)	M2	55
130	401000	CONCRETE PAVEMENT	M3	24
131	404092	SEAL PAVEMENT JOINT	M	47
132	043675	STEEL SOLDIER PILE (W360 X 91)	M	2,126
133	043676	915 MM DRILLED HOLE	M	870
134	490566	FURNISH STEEL PILING (HP 360 X 132)	M	1,272
135	490567	DRIVE STEEL PILE (HP 360 X 132)	EA	91
136	490657	600 MM CAST-IN-DRILLED-HOLE CONCRETE PILING	M	112
137	490663	1.5 M CAST-IN-DRILLED-HOLE CONCRETE PILING	M	37
138	490669	2.1 M CAST-IN-DRILLED-HOLE CONCRETE PILING	M	38
139	493487	2.4 M PERMANENT STEEL CASING	M	17
140	500001	PRESTRESSING CAST-IN-PLACE CONCRETE	LS	LUMP SUM

Item No.	Item Code	Item Description	Unit of Measure	Estimated Quantity
141	500050	TIEBACK ANCHOR	EA	96
142 (F)	510051	STRUCTURAL CONCRETE, BRIDGE FOOTING	M3	582
143 (F)	510053	STRUCTURAL CONCRETE, BRIDGE	M3	3,019
144 (F)	510060	STRUCTURAL CONCRETE, RETAINING WALL	M3	897
145 (F)	510072	STRUCTURAL CONCRETE, BARRIER SLAB	M3	138
146 (F)	043677	STRUCTURAL CONCRETE, APPROACH SLAB, (TYPE EQ (3) MOD)	M3	4
147 (F)	510502	MINOR CONCRETE (MINOR STRUCTURE)	M3	198
148	510526	MINOR CONCRETE (BACKFILL)	M3	50
149 (F)	511064	FRACTURED RIB TEXTURE	M2	465
150 (F)	511106	DRILL AND BOND DOWEL	M	119
151 (F)	043678	FURNISH PRECAST CONCRETE SLAB (BIKEPATH)	EA	36
152 (F)	043679	ERECT PRECAST CONCRETE SLAB (BIKEPATH)	EA	36
153	515041	FURNISH POLYESTER CONCRETE OVERLAY	M3	132
154	515042	PLACE POLYESTER CONCRETE OVERLAY	M2	6,350
155	043680	FURNISH POLYESTER CONCRETE OVERLAY (12MM)	M3	28
156	043681	PLACE POLYESTER CONCRETE OVERLAY (12MM)	M2	2,310
157	043682	PUBLIC SAFETY PLAN	LS	LUMP SUM
158 (F)	515072	CORE CONCRETE (0 - 50 MM)	M	59
159 (F)	518051	PTFE SPHERICAL BEARING	EA	4
160	043683	BIKEPATH EXPANSION JOINT	M	18

Item No.	Item Code	Item Description	Unit of Measure	Estimated Quantity
161	519120	JOINT SEAL (MR 15 MM)	M	4
162	043684	JOINT SEAL (MR 25 MM)	M	70
163	519128	JOINT SEAL ASSEMBLY (MR 100 MM)	M	8
164 (F)	043685	INSTALL MODULAR JOINT SEAL ASSEMBLY (HINGE W6RB)	LS	LUMP SUM
165 (F)	043686	INSTALL MODULAR JOINT SEAL ASSEMBLY (HINGE W8B)	LS	LUMP SUM
166 (F)	520102	BAR REINFORCING STEEL (BRIDGE)	KG	707,500
167 (F)	520103	BAR REINFORCING STEEL (RETAINING WALL)	KG	126,415
168 (F)	520110	BAR REINFORCING STEEL (EPOXY COATED) (BRIDGE)	KG	41,000
169 (F)	043687	BAR REINFORCING STEEL (BARRIER SLAB)	KG	10,400
170 (F)	520120	HEADED BAR REINFORCEMENT	EA	2,030
171 (F)	043688	ERECT STATE FURNISHED BIKEPATH	LS	LUMP SUM
172	560238	FURNISH SINGLE SHEET ALUMINUM SIGN (1.6 MM-UNFRAMED)	M2	44
173	560239	FURNISH SINGLE SHEET ALUMINUM SIGN (2.0 MM-UNFRAMED)	M2	12
174	560241	FURNISH SINGLE SHEET ALUMINUM SIGN (1.6 MM-FRAMED)	M2	3
175	562002	METAL (BARRIER MOUNTED SIGN)	KG	1,600
176	566011	ROADSIDE SIGN - ONE POST	EA	39
177	566012	ROADSIDE SIGN - TWO POST	EA	1
178	568001	INSTALL SIGN (STRAP AND SADDLE BRACKET METHOD)	EA	5
179	022873	DIRECTIONAL SIGNAL	EA	1
180 (F)	575004	TIMBER LAGGING	M3	62



Item No.	Item Code	Item Description	Unit of Measure	Estimated Quantity
181	043689	CLEAN AND PAINT (STEEL SOLDIER PILING)	LS	LUMP SUM
182	590301	WORK AREA MONITORING	LS	LUMP SUM
183	620901	150 MM ALTERNATIVE PIPE CULVERT	M	2
184	620904	300 MM ALTERNATIVE PIPE CULVERT	M	140
185	620909	450 MM ALTERNATIVE PIPE CULVERT	M	900
186	620913	600 MM ALTERNATIVE PIPE CULVERT	M	210
187 (F)	043690	CORRUGATED STEEL PIPE (ISOLATION SLEEVE)	KG	2,700
188	680270	50 MM PLASTIC PIPE UNDERDRAIN	M	17
189	680272	100 MM PLASTIC PIPE UNDERDRAIN	M	32
190	022874	200 MM PLASTIC UNDERDRAIN	M	120
191	680933	200 MM PERFORATED PLASTIC PIPE UNDERDRAIN	M	370
192	022875	100 MM PLASTIC PIPE (SCHEDULE 80)	M	2,160
193	700617	DRAINAGE INLET MARKER	EA	56
194	705334	300 MM ALTERNATIVE FLARED END SECTION	EA	3
195	705336	450 MM ALTERNATIVE FLARED END SECTION	EA	1
196	705337	600 MM ALTERNATIVE FLARED END SECTION	EA	1
197	022876	150 MM PVC SEWER PIPE	M	150
198	721011	ROCK SLOPE PROTECTION (NO. 2, METHOD B)	M3	5
199	721420	CONCRETE (DITCH LINING)	M3	12
200	722020	GABION	M3	330

Item No.	Item Code	Item Description	Unit of Measure	Estimated Quantity
201	729010	ROCK SLOPE PROTECTION FABRIC	M2	19
202	731502	MINOR CONCRETE (MISCELLANEOUS CONSTRUCTION)	M3	580
203	731517	MINOR CONCRETE (GUTTER)	M	170
204 (F)	750001	MISCELLANEOUS IRON AND STEEL	KG	7,833
205 (F)	750497	MISCELLANEOUS METAL (RESTRAINER - BAR TYPE)	KG	1,600
206 (F)	750498	MISCELLANEOUS METAL (RESTRAINER - CABLE TYPE)	KG	2,450
207 (F)	750501	MISCELLANEOUS METAL (BRIDGE)	KG	16,300
208 (F)	750505	BRIDGE DECK DRAINAGE SYSTEM	KG	2,000
209	022878	TYPE METAL FENCE	M	40
210	800391	CHAIN LINK FENCE (TYPE CL-1.8)	M	98
211	022879	CHAIN LINK FENCE (TYPE CL-1.2, BLACK VINYL-CLAD)	M	140
212	022880	CHAIN LINK FENCE (TYPE CL-3.6, BLACK VINYL-CLAD)	M	100
213	022881	CHAIN LINK FENCE (TYPE CL-2.4, BLACK VINYL-CLAD WITH EXTENSION ARM)	M	530
214	022882	CHAIN LINK FENCE (TYPE CL-1.8, BLACK VINYL-CLAD WITH EXTENSION ARM)	M	41
215	022883	1.5 M GATE (TYPE METAL)	EA	2
216	802592	2.4 M CHAIN LINK GATE (TYPE CL-1.8)	EA	4
217	022884	3.6 M CHAIN LINK GATE (TYPE CL-2.4, BLACK VINYL-CLAD WITH EXTENSION ARM)	EA	1
218	022885	2.4 M CHAIN LINK GATE (TYPE CL-2.4, BLACK VINYL-CLAD EXTENSION ARM)	EA	1
219	022886	2.4 M X 3.0 M CHAIN LINK GATE (TYPE CL-3.6, BLACK VINYL-CLAD)	EA	1
220	022887	5.8 M CANTILEVER SWING GATE (TYPE CHAIN LINK)	EA	3

Item No.	Item Code	Item Description	Unit of Measure	Estimated Quantity
221	022888	3.8 M CANTILEVER SWING GATE (TYPE METAL)	EA	2
222	022889	4.6 M CANTILEVER SWING GATE (TYPE METAL)	EA	1
223	820107	DELINEATOR (CLASS 1)	EA	69
224	832001	METAL BEAM GUARD RAILING	M	98
225 (F)	043691	PEDESTRIAN RAILING	M	123
226	833085	PIPE HANDRAILING	M	180
227 (F)	043692	BIKEPATH RAILING	M	889
228 (F)	043693	BIKEPATH FENCE	M	230
229	022890	BOLLARD	EA	8
230	022891	IN-GROUND TRAFFIC SPIKES	M	5
231	022892	REMOVE BOLLARD	EA	12
232	839585	ALTERNATIVE FLARED TERMINAL SYSTEM	EA	4
233	022893	ALTERNATE CRASH CUSHION	EA	4
234	839701	CONCRETE BARRIER (TYPE 60)	M	57
235	839710	CONCRETE BARRIER (TYPE 60S)	M	97
236	839712	CONCRETE BARRIER (TYPE 60SC)	M	29
237 (F)	839717	CONCRETE BARRIER (TYPE 732 MODIFIED)	M	771
238 (F)	043694	CONCRETE BARRIER (TYPE 60 MODIFIED)	M	45
239	840515	THERMOPLASTIC PAVEMENT MARKING	M2	180
240	840561	100 MM THERMOPLASTIC TRAFFIC STRIPE	M	6,240

Item No.	Item Code	Item Description	Unit of Measure	Estimated Quantity
241	840563	200 MM THERMOPLASTIC TRAFFIC STRIPE	M	470
242	840564	200 MM THERMOPLASTIC TRAFFIC STRIPE (BROKEN 3.66 M - 0.92 M)	M	20
243	840567	100 MM THERMOPLASTIC TRAFFIC STRIPE (BROKEN 1.83 M - 0.30 M)	M	70
244	840568	100 MM THERMOPLASTIC TRAFFIC STRIPE (BROKEN 3.66 M - 0.92 M)	M	530
245	840571	100 MM THERMOPLASTIC TRAFFIC STRIPE (BROKEN 5.18 M - 2.14 M)	M	1,060
246	022894	200 MM THERMOPLASTIC TRAFFIC STRIPE (BROKEN 1.22 M - 0.41 M)	M	59
247	022895	75 MM THERMOPLASTIC TRAFFIC STRIPE (BLACK)	M	930
248	022896	50 MM NON-REFLECTIVE PAINT (2-COAT WHITE)	M	280
249	842000	PARKING BUMPER (PRECAST CONCRETE)	EA	230
250	850101	PAVEMENT MARKER (NON-REFLECTIVE)	EA	310
251	850111	PAVEMENT MARKER (RETROREFLECTIVE)	EA	680
252	022897	UNDERGROUND	LS	LUMP SUM
253	022898	YBI TRANSITION STRUCTURES ROADWAY WESTBOUND	LS	LUMP SUM
254	022899	YBI TRANSITION STRUCTURES ROADWAY AND GIRDER EASTBOUND	LS	LUMP SUM
255	022900	TRAFFIC OPERATION SYSTEM	LS	LUMP SUM
256	022901	CALL BOX SYSTEM	LS	LUMP SUM
257	022902	YBI ELECTRICAL UTILITY RELOCATIONS	LS	LUMP SUM
258	022903	REMOVING AND SALVAGING ELECTRICAL DEVICES	LS	LUMP SUM
259	022904	PREFORMED LOOP DETECTOR STATION (10 LOOPS PER STATION)	EA	5
260	022905	FIBER OPTIC DATA MODEM	EA	1

Item No.	Item Code	Item Description	Unit of Measure	Estimated Quantity
261	022906	FIBER OPTIC SPLICE CLOSURE	EA	6
262	022907	FIBER OPTIC CABLE (12-FIBER INDOOR/ OUTDOOR)	M	690
263	022908	FIBER OPTIC CABLE (72-FIBER INDOOR/ OUTDOOR)	M	240
264	860090	MAINTAINING EXISTING TRAFFIC MANAGEMENT SYSTEM ELEMENTS DURING CONSTRUCTION	LS	LUMP SUM
265	022909	50 MM GAS PE PIPE	M	190
266	022910	100 MM GAS PIPE	M	70
267	022911	INSTALL FIRE HYDRANT	EA	1
268	022912	BASKETBALL AND VOLLEYBALL COURT	LS	LUMP SUM
269	994425	BENCH	EA	2
270 (F)	994650	BUILDING WORK	LS	LUMP SUM
271	994901	TRASH RECEPTACLE	EA	1
272	999990	MOBILIZATION	LS	LUMP SUM

# **SPECIAL PROVISIONS**

## **SECTION 1. (BLANK)**

## **SECTION 2. BIDDING**

### **2-1.01 ESCROW OF BID DOCUMENTATION**

Bid documentation shall consist of all documentary and calculated information generated by the bidder in preparation of the bid. The bid documentation shall conform to the requirements in these special provisions, and shall be submitted to the Department and held in escrow for the duration of the contract.

The escrowed bid documents will be the only documents accepted from the Contractor regarding preparation of the bid.

In signing the bid, the bidder certifies that the material submitted for escrow constitutes all the documentary information used in preparation of the bid, that he has personally examined the contents of the container, and that they are complete.

The first, second, and third apparent low bidders shall submit to the Department of Transportation, at the District 4, Duty Senior Office, 111 Grand Avenue, Oakland, CA, telephone: (510) 286-5209, email: duty\_senior\_district04@dot.ca.gov the identification of the bidder's representative authorized to present the bid documentation and the persons responsible for preparing the bidder's bid before the close of business on the first Monday after bid opening.

Nothing in the bid documentation shall be construed to change or modify the terms or conditions of the contract.

Escrowed bid documentation will not be used for pre-award evaluation of the bidder's anticipated methods of construction, nor to assess the bidder's qualifications for performing the work.

Bid documentation shall clearly itemize the bidder's estimated costs of performing the work. The documentation submitted shall be complete and so detailed as to allow for an in-depth analysis of the Contractor's bid.

The bidder shall submit its bid documentation which shall include, but not be limited to:

1. Quantity takeoffs
2. Rate schedules for the direct costs and the time- and nontime-related indirect costs for:
  - 2.1. Labor (by craft)
  - 2.2. Plant and equipment ownership and operation
  - 2.3. Permanent and expendable materials, insurance, and subcontracted work
3. Estimated construction schedules, including sequence and duration, and development of production rates
4. Quotations, terms, and limitations of quotes and subcontracts related to subcontractors, manufacturers, and suppliers
5. Estimates of field and home office overhead
6. Estimated contingency and profit for each bid item of work
7. Names of the persons responsible for preparing the bidder's estimate and other reports, calculations, assumptions, and supplemental information used by the bidder to arrive at the estimate submitted with the bid book
8. Bid documentation for each subcontractor, manufacturer, and supplier whose subcontract or purchase orders exceed or are expected to exceed \$250,000.00. Bid documentation for other subcontractors, manufacturers, and suppliers may be submitted, if required by the bidder, or requested by the subcontractor, manufacturer, or supplier.

If required by the bidder or requested by the subcontractor, manufacturer, or supplier, additional information may be submitted by the subcontractor, manufacturer, or supplier. Subcontractor, manufacturer, and supplier bid documentation shall conform to the requirements for the bidder's documentation and shall be enclosed with the bidder's submittal regardless of whether or not subcontracts or purchase orders have been executed or entered into on the date that bid documentation is submitted for escrow. If at the time that bid documentation is submitted for escrow, the subcontractor, manufacturer, or supplier does not have an executed subcontract or purchase order, and a subcontract or purchase order is subsequently executed, then a copy of the executed subcontract or purchase order

shall be submitted into escrow within 14 days of the execution of the respective subcontract or purchase order. The examination of subcontractors', manufacturers', and suppliers' bid documentation will be accomplished in the same manner as for the bidder's bid documentation. If a subcontractor, manufacturer, or supplier is replaced, bid documentation for the new subcontractor, manufacturer, or supplier shall be submitted for review and escrow before authorization for the substitution will be granted. Upon written request of a subcontractor, manufacturer, or supplier, the bid documentation from that subcontractor, manufacturer, or supplier shall be reviewed only by the subcontractor, manufacturer, or supplier and the Department and shall be placed in a separate container within the bidder's container. The written request from the subcontractor, manufacturer, or supplier shall be included with the bid documentation.

If the bidder is a joint venture, the bid documentation shall include the joint venture agreement, the joint venture estimate comparison, and final reconciliation of the joint venture bid.

Copies of the bid books submitted by the first, second, and third low bidders will be provided to the first, second, and third apparent low bidders by the District for inclusion in the bid documentation to be escrowed.

The first, second, and third apparent low bidders shall present the bid documentation for escrow at the District 4, Duty Senior Office, 111 Grand Avenue, Oakland, CA, telephone: (510) 286-5209 on the first Tuesday between 1:00 p.m. and 2:00 p.m., following the time indicated in the "Notice to Bidders" for the opening of bids. The fourth and subsequent apparent low bidders shall present the bid documentation for escrow if requested by the Department to do so.

Bid documentation shall be submitted as a paper copy in a sealed container, clearly marked with the bidder's name, date of submittal, project contract number, and the words, "Bid Documentation for Escrow."

Failure to submit the actual and complete bid documentation as specified herein within the time specified shall be cause for rejection of the bid.

Upon submittal, the bid documentation of the apparent low bidder will be examined and inventoried by the duly designated representatives of the low bidder and the Department to ensure that the bid documentation is authentic, legible, and in accordance with the terms of this section "Escrow of Bid Documentation." The examination will not include review of, nor will it constitute approval of, proposed construction methods, estimating assumptions, or interpretation of the contract. The examination will not alter any conditions or terms of the contract. The acceptance or rejection by the Department that the submitted bid documents are in compliance with this section, "Escrow of Bid Documentation," shall be completed within 48 hours of the time the bid documentation is submitted by the low bidder.

At the completion of the examination, the bid documents will be sealed and jointly deposited at an agreed commercial business in Oakland, CA.

Bid documentation submitted by the second and third apparent low bidders will be jointly deposited at an agreed commercial business in Oakland, CA. If the apparent low bid is withdrawn or rejected, the bid documentation of the second low bidder will be examined and inventoried in the manner specified above, then sealed and deposited again in escrow. If the second low bid is withdrawn or rejected, the bid documentation of the third low bidder will be examined and inventoried in the manner specified above, then sealed and deposited again in escrow. Bid documentation from subsequent bidders, if requested, will be examined and inventoried in the same manner as specified above, then sealed and deposited in escrow. Upon execution and final approval of the contract or rejection of all bids, the bid documentation will be returned to any remaining unsuccessful bidders.

Any and all components of the escrowed bid documentation may be examined by the designated representatives of both the Department and the Contractor, at any time deemed necessary by either the Department or the Contractor to assist in the negotiation of price adjustments and change orders, or to assist in the potential resolution or in the settlement of claims or disputes. Such a joint review shall be performed within 15 days of receipt of a written request to do so by either party. If the Contractor refuses to participate in the joint examination of any and all components of the escrowed bid documentation as provided herein, such refusal shall be considered as a failure by the Contractor to exhaust administrative claim remedies with respect to the particular protest, notice of potential claim, or claim. In addition, this refusal by the Contractor shall constitute a bar to future arbitration with respect to the protest, potential claim, or claim as provided by Section 10240.2 of the California Public Contract Code.

If requested by a Dispute Resolution Board, the escrowed bid documentation may be utilized to assist the Board in its recommendations.

The bid documentation submitted by the Contractor will be held in escrow until the contract has been completed, the ultimate resolution of all disputes and claims has been achieved, and receipt of final payment has been accepted by the Contractor. The escrowed bid documentation will then be released from escrow to the Contractor.

The bid documentation submitted by the bidder is, and shall remain, the property of the bidder, and is subject to only joint review by the Department and the bidder or upon written request of a subcontractor, manufacturer, or supplier shall be reviewed only by the subcontractor, supplier, or manufacturer and the Department unless it involves a dispute or claim. The Department stipulates and expressly acknowledges that the submitted bid



documentation constitutes trade secrets and will not be deemed public records. This acknowledgment is based on the Department's express understanding that the information contained in the bid documentation is not known outside the bidder's business, is known only to a limited extent and only by a limited number of employees of the bidder, is safeguarded while in the bidder's possession, is extremely valuable to the bidder and could be extremely valuable to the bidder's competitors by virtue of it reflecting the bidder's contemplated techniques of construction. The Department acknowledges that the bid documentation includes a compilation of information used in the bidder's business, intended to give the bidder an opportunity to obtain an advantage over competitors who do not know of or use the contents of the documentation. The Department agrees to safeguard the bid documentation, and all information contained therein, against disclosure, including disclosure of subcontractor bid documentation to the Contractor and other subcontractors to the fullest extent permitted by law. However, in the event of arbitration or litigation, the bid documentation shall be subject to discovery, and the Department assumes no responsibility for safeguarding the bid documentation unless the Contractor has obtained an appropriate protective order issued by the arbitrator or the court.

Full compensation for preparing the bid documentation, submitting it for escrow, and presenting it upon request of the Engineer or a Dispute Resolution Board shall be considered as included in the contract prices paid for the various items of work, and no additional compensation will be allowed therefor.

The direct cost of depositing the bid documentation in escrow at the agreed commercial business will be paid by the Department.

## **2.1-02 MANDATORY PREBID MEETING AND SITE TOUR**

The Department will conduct a mandatory prebid meeting for this contract. The purpose of the meeting is to provide small businesses the opportunity to meet and interact with prospective bidders and increase participation in the performance of contracts.

Prospective bidders must attend the mandatory prebid meeting. The bidder's representative must be a company officer, project superintendent, or project estimator. For a joint venture, one of the parties must attend the mandatory prebid meeting. The Department will not accept bids from bidders who do not attend the mandatory prebid meeting.

A sign-up sheet will be used to identify all prospective bidders including name and title of the company representative attending the mandatory prebid meeting. The Department may hold a single prebid meeting for more than one contract. Make sure you sign the sign-up sheet for the contract you intend to bid on. If bidding multiple contracts, sign each sign-up sheet for each contract you intend to bid on.

The successful bidder will be required to report small businesses hired to work on this contract as a result of the mandatory prebid meeting.

A required project site tour will be conducted immediately after the prebid meeting.

The Department will provide transportation for prospective bidders to and from the project site. Prospective bidders must use the Department provided transportation to and from the project site tour.

Prospective bidders are encouraged to pre-register to confirm their attendance by contacting the Duty Senior, District 04 Office, 111 Grand Avenue, Oakland, CA 94612, email: [duty\\_senior\\_district04@dot.ca.gov](mailto:duty_senior_district04@dot.ca.gov), telephone number (510) 286-5209.

## **2-1.03 SUBMITTALS WITH BID**

The Contractor shall perform a complete 3-D computer analysis and evaluation of the Cantilever Truss for the planned removal procedure. The following documentation regarding demolition of the Cantilever Truss shall be submitted with the bid:

- 1) Detailed drawings illustrating the planned demolition procedure that meet the following minimum requirements:
  - a. The removal sequence shall conform to the removal sequence shown on plan sheet titled "Existing Cantilever Truss Demolition, Demolition Limits Plan".
  - b. Temporary supports will not be allowed in the water between Pier E2 and Pier E3.
  - c. Temporary supports shall be used between Pier E1 and E2 and between Pier E3 and E4.
  - d. The drawings shall clearly show a longitudinal connection that transfers the longitudinal load of the partially demolished structure to the adjacent superstructure at Pier E4. The assumed longitudinal load to be used shall be the sum of the actual horizontal loads due to equipment, construction sequence or other causes, and the wind loads shown on the plans, but in no case shall the assumed longitudinal load to be resisted be less than 5 percent of the total dead load of the structure to be removed.

- e. The drawings shall clearly illustrate the vertical, lateral and longitudinal structural load paths at each stage of demolition.
- f. The drawings shall be signed and stamped by the Contractor's engineer and shall be independently checked, stamped and signed by another registered Civil Engineer. The check engineer shall not be an employee of the Contractor and shall not be employed by the same firm as the Contractor's engineer.

The drawings shall be submitted on 279x432 paper and text and details shall be legible and suitable for photocopying. Only one set of drawings is required. Drawings shall be as complete and comprehensive as possible to demonstrate a clear plan for demolition.

2) The Contractor's registered engineer and the check engineer shall provide certification that the submittal complies with all contract requirements and is adequate for the purpose intended.

The Contractor's engineer shall be registered as a Civil Engineer in California. The engineer shall have at least 10 years experience as a registered Civil Engineer, shall have been in responsible charge for at least three bridge demolition projects and shall have prepared demolition plans for at least one large, continuous steel truss bridge. The check engineer shall have at least the same experience and qualifications. The Contractor's engineer and the check engineer shall provide resumes that meet the above requirements.

The check engineer shall not be an employee of the Contractor and shall not be employed by the same firm as the Contractor's engineer.

3) The Contractor's engineer and the check engineer shall provide certifications that the information in the Supplemental Project Information was reviewed, understood and considered in preparation of the submittal including the following:

- a. Original bridge plans, specifications and construction testing reports
- b. Existing bridge plans, specifications and construction testing reports for modifications to the existing bridge.
- c. Original construction sequence
- d. Bridge maintenance and inspection reports

Bid submittals that do not meet the above requirements will be considered non-responsive and will be rejected.

The Department's acceptance of the submittals with bid does not relieve bidders of the responsibility for work of the quality specified in these special provisions and shown on the plans.

Attention is directed to "Bidder's Compensation" of these special provisions. The contract provisions in this section shall be considered as part of the cost of preparing bids and no separate payment will be made therefor.

#### **2-1.04 PRE-AWARD QUALIFICATIONS QUESTIONNAIRE**

The Department has established that the bidder shall submit information regarding the bidder's qualifications for performing demolition of the Cantilever Truss. Bidders shall submit, with the bid, responses to the "Pre-Award Qualifications Questionnaire" (PAQQ), included in the Bid Book. In signing the signature page of the Bid, the bidder certifies that the information and answers in response to the PAQQ are complete and accurate.

The bidder's attention is directed to "Pre-Award Qualifications Review," of these special provisions regarding requirements of acceptance of the bid. The Department's acceptance of the responses to the PAQQ does not relieve bidders of the responsibility for work of the quality specified in these special provisions and shown on the plans.

#### **2-1.05 SMALL BUSINESS AND NON-SMALL BUSINESS SUBCONTRACTOR PREFERENCES**

##### **General**

The Department applies Small Business Preference or Non-Small Business Preference under Govt Code § 14835 et seq. and 2 CA Code of Regs § 1896 et seq.

Contractors, subcontractors, suppliers, and service providers who qualify as small businesses are encouraged to apply for certification as a small business by submitting their application to the Department of General Services, Office of Small Business and DVBE Services.

Contract award is based on the total bid, not the reduced bid.

### **Small Business Preference**

The Department allows a bidder certified as a small business by the Office of Small Business and DVBE Services, Department of General Services, a preference if:

1. The bidder submitted a completed Request for Small Business Preference or Non–Small Business Preference form with its bid
2. The low bidder did not request the preference or is not certified as a small business

The bidder's signature on the Request for Small Business Preference or Non–Small Business Preference form certifies that the bidder is certified as a small business at the time and day of bid or has submitted a complete application to the Department of General Services. The complete application and any required substantiating documentation must be received by the Department of General Services by 5:00 p.m. on bid opening date.

The Department of General Services determines if a bidder was certified on bid opening date. The Department confirms the bidder's status as a small business before applying the small business preference.

The small business preference is a reduction for bid comparison in the total bid submitted by the small business contractor by the lesser of:

1. 5 percent of the verified total bid of the low bidder
2. \$50,000

If after the application of the small business preference the Department determines that a certified small business bidder is the low bidder, the Department does not consider a request for non–small business preference.

### **Non–Small Business Subcontractor Preference**

The Department allows a bidder not certified as a small business by the Office of Small Business and DVBE Services, Department of General Services, a preference if:

1. The bidder submitted a completed Request for Small Business Preference or Non–Small Business Preference form with its bid.
2. The Certified Small Business Listing for the Non–Small Business Preference form shows that you are subcontracting at least 25 percent to certified small businesses. You may submit this information with your bid. If you do not, submit it so that it is received by the Office Engineer no later than 4:00 p.m. on the 2nd business day after bid opening.

Each listed subcontractor and supplier must be certified as a small business at the time and day of bid or must have submitted a complete application to the Department of General Services. The complete application and any required substantiating documentation must be received by the Department of General Services by 5:00 p.m. on bid opening date.

The non–small business subcontractor preference is a reduction for bid comparison in the total bid submitted by the non–small business contractor requesting the preference by the lesser of:

1. 5 percent of the verified total bid of the low bidder
2. \$50,000

## **2-1.06 DISABLED VETERAN BUSINESS ENTERPRISES**

### **General**

Take necessary and reasonable steps to ensure that DVBEs have opportunity to participate in the contract. Comply with Mil & Vet Code § 999 et seq.

The Department encourages bidders to obtain DVBE participation in order to ensure the Department achieves its State-mandated overall DVBE goal.

If you obtain DVBE participation:

1. Complete and submit the Certified DVBE Summary form. List all DVBE participation on this form.
2. List each 1st tier DVBE subcontractor on the Subcontractor List form regardless of percentage of the total bid.

### **DVBE Incentive**

The Department grants a DVBE incentive to each bidder who achieves a DVBE participation of 1 percent or greater (Mil & Vet Code 999.5 and Code of Regs § 1896.98 et seq).

To receive this incentive, submit the Certified DVBE Summary form. If you do not submit this form with your bid and you are the low bidder or the 2nd or 3rd low bidder, submit it so that it is received by the Office Engineer no later than 4:00 p.m. on the 4th business day after bid opening. If a DVBE joint venture is used, submit the joint venture agreement with the Certified DVBE Summary form. Other bidders may be required to submit this form if bid ranking changes.

### **Incentive Evaluation**

The Department applies the Small Business and Non-Small Business preference during bid verification and proceeds with the following evaluation for DVBE incentive.

The DVBE incentive is a reduction, for bid comparison only, in the total bid submitted by the lesser of:

1. Percentage of DVBE achievement, rounded to 2 decimal places, of the verified total bid of the low bidder
2. 5 percent of the verified total bid of the low bidder
3. \$250,000

The Department applies DVBE incentive and determines if bid ranking changes.

A non-small business bidder cannot displace a small business bidder. However, a small business bidder with higher DVBE achievement can displace another small business bidder.

The Department proceeds with awarding the contract to the new low bidder and posts the new verified bid results at its Office Engineer Web site.

### **2-1.07 CALIFORNIA COMPANIES**

Under Pub Cont Code § 6107, the Department gives preference to a "California company," as defined, for bid comparison purposes over a nonresident contractor from any state that gives or requires a preference to be given to contractors from that state on its public entity construction contracts.

Complete a California Company Preference form.

The California company reciprocal preference amount is equal to the preference amount applied by the state of the nonresident contractor with the lowest responsive bid unless the California company is eligible for a small business preference or a non-small business subcontractor preference; in which case the preference amount is the greater of the two, but not both.

If the low bidder is not a California company and a California company's bid with reciprocal preference is equal to or less than the lowest bid, the Department awards the contract to the California company on the basis of its total bid.

### **2-1.08 TIE BID RESOLUTION**

If a small business bidder and a non-small business bidder request preferences and the reductions result in a tied bid, the Department awards the contract to the small business bidder.

If a DVBE small business bidder and a non-DVBE small business bidder request preferences and the reduction results in a tied bid, the Department awards the contract to the DVBE small business bidder.

After bid verification, if there is a tie between 2 or more bidders, the Department breaks the tie by tossing a coin.

### **2-1.09 OPT OUT OF PAYMENT ADJUSTMENTS FOR PRICE INDEX FLUCTUATIONS**

You may opt out of the payment adjustments for price index fluctuations as specified in "Payment Adjustments for Price Index Fluctuations" of these special provisions. If you elect to opt out of the provisions of this specification, you must complete the "Opt Out of Payment Adjustments for Price Index Fluctuations" form. The completed form must be submitted with your bid.

## **SECTION 3. CONTRACT AWARD AND EXECUTION**

### **3-1.01 PRE-AWARD QUALIFICATIONS REVIEW**

The Engineer will review the responses to the "Pre-Award Qualifications Questionnaire." The Engineer will make a determination on the bidder's qualifications for performing the work in a manner that is safe for the workers and the public, based on the bidder's experience and qualifications.

If the Engineer determines it necessary, a pre-award qualifications review meeting will be conducted by an agent of the Director, and the apparent low bidder shall participate. Notification of whether a meeting will be conducted will be provided on or before the first Thursday following the time indicated in the "Notice to Contractors" for the opening of bids. The meeting, if held, will be on second Thursday following the time indicated in the "Notice to Contractors" for the opening of bids at 10:00 a.m. in the third floor conference room, 1727 30<sup>th</sup> Street, Sacramento, CA. 95816. Non-attendance by the apparent low bidder at the pre-award qualifications review meeting shall be just cause for rejection of the bid and forfeiture of the proposal guaranty.

At the pre-award qualifications review meeting, the low bidder shall provide an authorized representative prepared to discuss and answer questions relative to the responses to the "Pre-Award Qualifications Questionnaire." If the bidder is not qualified to perform the demolition work with its own forces, appropriate representatives from the proposed qualified subcontractors shall also attend the meeting.

Prior to award, the Director's agent will prepare written findings and recommendations to the Engineer regarding award of the contract to the apparent low bidder based on the responses to the "Pre-Award Qualifications Questionnaire," and the information provided at the pre-award qualifications review meeting, if held. Award of the contract to the apparent low bidder will be based on the Engineer's determination that the bidder is the lowest responsible bidder, possessing the necessary attributes to satisfactorily perform the contract.

The decision of the Engineer regarding the bidder's qualifications shall be final.

The second and third apparent bidders shall participate in pre-award qualifications review meetings if requested to do so by the Department. Notification by the Department will be provided at least 48 hours prior to the pre-award qualifications review meeting. Non-attendance by the second or third apparent low bidder at any such requested meeting shall be just cause for rejection of bid and forfeiture of the proposal guaranty.

The experience and qualifications of supervisory and engineering personnel designated to replace those listed in the responses to the "Pre-Award Qualifications Questionnaire" will be subject to review by the Department.

Successful completion of the pre-award qualifications process does not relieve the Contractor of the responsibility for completing the work as described in the project plans and the specifications.

### **3-1.02 CONTRACT AWARD**

If the Department awards the Contract, the award is made to the lowest responsible bidder within 60 days.

### **3-1.03 SMALL BUSINESS PARTICIPATION REPORT**

The Department has established an overall 25 percent small business participation goal. To determine if the goal is achieved, the Department is tracking small business participation on all contracts.

Complete and sign the Small Business (SB) Participation Report form included in the contract documents even if no small business participation is reported. Submit it with the executed contract.

## **SECTION 4. BEGINNING OF WORK, TIME OF COMPLETION, AND LIQUIDATED DAMAGES**

The 1st working day is the 55th day after contract approval or on the day you start work at the job site, whichever occurs first.

Do not start work at the job site, except for measuring controlling field dimensions and locating utilities, until the Engineer approves your submittal for:

1. Baseline Progress Schedule (Critical Path Method)
2. Storm Water Pollution Prevention Plan (SWPPP)
3. Notification of Dispute Review Board (DRB) nominee and disclosure statement

In addition to the above submittals, do not start work at the job site, except for measuring controlling field dimensions and locating utilities, until you submit:

1. Notice of Materials To Be Used.
2. Contingency plan for reopening closures to public traffic.
3. Written statement from the vendor that the order for the sign panels has been received and accepted by the vendor. The statement must show the dates that the materials will be shipped.
4. Written statement from the vendor that the order for electrical material has been received and accepted by the vendor. The statement must show the dates that the materials will be shipped.
5. Written statement from the vendor that the order for structural steel has been received and accepted by the vendor. The statement must show the dates that the materials will be shipped.

You may start work at the job site before the 55th day after contract approval if:

1. You obtain required approval for each submittal before the 55th day
2. The Engineer authorizes it in writing

The Department grants a time extension if a delay is beyond your control and prevents you from starting work at the job site on the 1st working day.

The second through fourth paragraphs, inclusive, and the first sentence of the fifth paragraph of Section 8-1.06, "Time of Completion," of the Standard Specifications shall not apply. A working day is defined as any day, with no exceptions.

Complete the Designated Portion of Work within the number of working days bid.

Designated Portion of Work is defined as all structural, roadway, electrical and mechanical work required to remove the cantilever bridge superstructure from approximately 125 meters west of the Pier E3 center line to Pier E1, remove Pier E1 to approximately elevation 45, remove the temporary bypass structure from Pier E1 to Bent 45A, complete the eastbound On-ramp, the bike path, the bike path landing and Southgate Road as shown on the plans in accordance with the Stage Construction plans Stage 1 through Stage 3 Phase 2.

It is anticipated that the existing San Francisco-Oakland Bay Bridge will be closed and the new San Francisco-Oakland Bay Bridge opened to traffic over Labor Day weekend of year 2013. Dismantling of the existing San Francisco-Oakland Bay Bridge may commence upon closure of the existing bridge to public traffic.

Bids in which the number of working days bid for completion of the Designated Portion of Work exceed 1030 days are considered non-responsive and will be rejected.

The Designated Portion of Work shall be diligently prosecuted to completion before the expiration of number of days bid starting on the 55th day after contract approval or on the day you start work at the job site, whichever occurs first.

Liquidated damages are \$30,000 per day starting on the 1st day after exceeding the number of working days bid for completion of the Designated Portion of Work.

Complete all work within 180 working days after the number of working days bid for the Designated Portion of Work.

Liquidated damages for completion of all work are \$20,000 per day starting on the 1st day after exceeding 180 working days after the number of working days bid for the Designated Portion of Work.

## **SECTION 5. GENERAL**

### **5-1.01 EMISSIONS REDUCTION**

Contract execution constitutes submittal of the following certification:

I am aware of the emissions reduction regulations being mandated by the California Air Resources Board.  
I will comply with such regulations before commencing the performance of the work and maintain compliance throughout the duration of this contract.

### **5-1.02 NON-SMALL BUSINESSES**

Use each subcontractor as shown on the Certified Small Business Listing for the Non-Small Business Preference form unless you receive authorization for a substitution.

The requirement that small businesses be certified by the bid opening date does not apply to small business substitutions after contract award.

Maintain records of subcontracts made with certified small business subcontractors and records of materials purchased from certified small business suppliers. Include in the records:

1. Name and business address of each business
2. Total amount paid to each business

For the purpose of determining compliance with 2 CA Code of Regs § 1896 et seq.:

1. Provide the Department relevant information requested.

2. Upon reasonable notice and during normal business hours, permit access to its premises for the purpose of:
  - 2.1. Interviewing employees
  - 2.2. Inspecting and copying books, records, accounts and other material that may be relevant to a matter under investigation

#### **5-1.03 DISABLED VETERAN BUSINESS ENTERPRISES**

Use each DVBE as shown on the Certified DVBE Summary form unless you receive authorization for a substitution.

The requirement that DVBEs be certified by the bid opening date does not apply to DVBE substitutions after contract award.

Maintain records of subcontracts made with certified DVBEs. Include in the records:

1. Name and business address of each business
2. Total amount paid to each business

For the purpose of determining compliance with Pub Cont Code § 10115 et seq.:

1. Upon contract completion, complete and submit Final Report - Utilization of Disabled Veteran Business Enterprises (DVBE) State Funded Projects Only form
2. Upon reasonable notice and during normal business hours, permit access to its premises for the purpose of:
  - 2.1. Interviewing employees
  - 2.2. Inspecting and copying books, records, accounts and other material that may be relevant to a matter under investigation

#### **5-1.04 PARTNERING DISPUTE RESOLUTION**

The Department encourages the project team to exhaust the use of partnering in dispute resolution before engagement of an objective third party. Comply with Section 5-1.012, "Partnering," of the Standard Specifications.

For certain disputes, facilitated partnering session or facilitated dispute resolution session may be appropriate and effective in clarifying issues and resolving all or part of a dispute.

To afford the project team enough time to plan and hold the session, a maximum of 20 days may be added to the dispute resolution board (DRB) referral time following the Engineer's written response to a supplemental potential claim record as specified in Section 5-1.15, "Dispute Resolution," of the Standard Specifications.

To allow this additional referral time, the project team must document its agreement and intention in the dispute resolution plan of the partnering charter. The team may further document agreement of any associated criteria to be met for use of the additional referral time.

If the session is not held, the DRB referral time remains in effect as specified in Section 5-1.15, "Dispute Resolution," of the Standard Specifications.

#### **5-1.05 PAYMENT ADJUSTMENTS FOR PRICE INDEX FLUCTUATIONS**

##### **GENERAL**

##### **Summary**

This section applies to asphalt contained in materials for pavement structural sections and pavement surface treatments such as hot mix asphalt (HMA), tack coat, asphaltic emulsions, bituminous seals, asphalt binders, and modified asphalt binders placed in the work. This section does not apply if you opted out of payment adjustment for price index fluctuations at the time of bid.

The Engineer adjusts payment if the California Statewide Crude Oil Price Index for the month the material is placed is more than 5 percent higher or lower than the price index at the time of bid.

The California Statewide Crude Oil Price Index is determined each month on or about the 1st business day of the month by the Department using the average of the posted prices in effect for the previous month as posted by Chevron, ExxonMobil, and ConocoPhillips for the Buena Vista, Huntington Beach, and Midway Sunset fields.

If a company discontinues posting its prices for a field, the Department determines the index from the remaining posted prices. The Department may include additional fields to determine the index.

For the California Statewide Crude Oil Price Index, go to:

<http://www.dot.ca.gov/hq/construc/crudeoilindex/>

If the adjustment is a decrease in payment, the Department deducts the amount from the monthly progress payment.

The Department includes payment adjustments for price index fluctuations when making adjustments under Section 4-1.03B, "Increased or Decreased Quantities," of the Standard Specifications.

If you do not complete the work within the contract time, payment adjustments during the overrun period are determined using the California Statewide Crude Oil Price Index in effect for the month in which the overrun period began.

If the price index at the time of placement increases:

1. 50 percent or more over the price index at bid opening, notify the Engineer.
2. 100 percent or more over the price index at bid opening, do not furnish material containing asphalt until the Engineer authorizes you to proceed with that work. The Department may decrease Bid item quantities, eliminate Bid items, or terminate the contract.

### **Submittals**

Before placing material containing asphalt, submit the current sales and use tax rate in effect in the tax jurisdiction where the material is to be placed.

Submit certified weight slips for HMA, tack coat, asphaltic emulsions, and modified asphalt binders, including those materials not paid for by weight, as specified in Section 9-1.01, "Measurement of Quantities," of the Standard Specifications. For slurry seals, submit certified weight slips separately for the asphaltic emulsion.

## **ASPHALT QUANTITIES**

### **General**

Interpret the term "ton" as "tonne" for projects using metric units.

### **Hot Mix Asphalt**

The Engineer calculates the quantity of asphalt in HMA using the following formula:

$$Q_h = HMATT \times [X_a / (100 + X_a)]$$

where:

$Q_h$  = quantity in tons of asphalt used in HMA  
 $HMATT$  = HMA total tons placed  
 $X_a$  = theoretical asphalt content from job mix formula expressed as percentage of the weight of dry aggregate

### **Rubberized Hot Mix Asphalt**

The Engineer calculates the quantity of asphalt in rubberized HMA (RHMA) using the following formula:

$$Q_{rh} = RHMATT \times 0.80 \times [X_{arb} / (100 + X_{arb})]$$

where:

$Q_{rh}$  = quantity in tons of asphalt in asphalt rubber binder used in RHMA  
 $RHMATT$  = RHMA total tons placed  
 $X_{arb}$  = theoretical asphalt rubber binder content from the job mix formula expressed as percentage of the weight of dry aggregate

### **Modified Asphalt Binder in Hot Mix Asphalt**

The Engineer calculates the quantity of asphalt in modified asphalt binder using the following formula:

$$Q_{mh} = MHMATT \times [(100 - X_{am}) / 100] \times [X_{mab} / (100 + X_{mab})]$$



where:

Qmh = quantity in tons of asphalt in modified asphalt binder used in HMA  
MHMATT = modified asphalt binder HMA total tons placed  
Xam = specified percentage of asphalt modifier  
Xmab = theoretical modified asphalt binder content from the job mix formula expressed as percentage of the weight of dry aggregate

### **Hot Mix Asphalt Containing Reclaimed Asphalt Pavement (RAP)**

The Engineer calculates the quantity of asphalt in HMA containing RAP using the following formulas:

$$Q_{rap} = HMATT \times [X_{aa} / (100 + X_{aa})]$$

where:

$$X_{aa} = X_{ta} - [(100 - X_{new}) \times (X_{ra} / 100)]$$

and

Qrap = quantity in tons of asphalt used in HMA containing RAP  
HMATT = HMA total tons placed  
Xaa = asphalt content of HMA adjusted to account for the asphalt content in RAP expressed as percentage of the weight of dry aggregate  
Xta = total asphalt content of HMA expressed as percentage of the weight of dry aggregate  
Xnew = theoretical percentage of new aggregate in the HMA containing RAP determined from RAP percentage in the job mix formula  
Xra = asphalt content of RAP expressed as percentage

### **Tack Coat**

The Engineer calculates the quantity of asphalt in tack coat (Qtc) as either:

1. Asphalt binder using the asphalt binder total tons placed as tack coat
2. Asphaltic emulsion by applying the formula in "Asphaltic Emulsion" to the asphaltic emulsion total tons placed as tack coat

### **Asphaltic Emulsion**

The Engineer calculates the quantity of asphalt in asphaltic emulsions, including fog seals and tack coat, using the following formula:

$$Q_e = AETT \times (X_e / 100)$$

where:

Qe = quantity in tons of asphalt used in asphaltic emulsions  
AETT = undiluted asphaltic emulsions total tons placed  
Xe = minimum percent residue specified in Section 94, "Asphaltic Emulsions," of the Standard Specifications based on the type of emulsion used

You may, as an option, determine "Xe" by submitting actual daily test results for asphalt residue for the asphaltic emulsion used. If you choose this option, you must:

1. Take 1 sample every 200 tons but not less than 1 sample per day in the presence of the Engineer from the delivery truck, at midload from a sampling tap or thief, and in the following order:
  - 1.1. Draw and discard the 1st gallon
  - 1.2. Take two separate 1/2-gallon samples
2. Submit 1st sample at the time of sampling
3. Provide 2nd sample within 3 business days of sampling to an independent testing laboratory that participates in the AASHTO Proficiency Sample Program
4. Submit test results from independent testing laboratory within 10 business days of sample date

### **Slurry Seal**

The Engineer calculates the quantity of asphalt in slurry seals (Qss) by applying the formula in "Asphaltic Emulsion" to the actual quantity of asphaltic emulsion used in producing the slurry seal mix.

### **Modified Asphalt Binder**

The Engineer calculates the quantity of asphalt in modified asphalt binder using the following formula:

$$Q_{mab} = MABTT \times [(100 - X_{am}) / 100]$$

where:

Q<sub>mab</sub> = quantity in tons of asphalt used in modified asphalt binder  
MABTT = modified asphalt binder total tons placed  
X<sub>am</sub> = specified percentage of asphalt modifier

### **Other Materials**

For other materials containing asphalt not covered above, the Engineer determines the quantity of asphalt (Qo).

### **PAYMENT ADJUSTMENTS**

The Engineer includes payment adjustments for price index fluctuations in progress pay estimates. If material containing asphalt is placed within 2 months during 1 estimate period, the Engineer calculates 2 separate adjustments. Each adjustment is calculated using the price index for the month in which the quantity of material containing asphalt subject to adjustment is placed in the work. The sum of the 2 adjustments is used for increasing or decreasing payment in the progress pay estimate.

The Engineer calculates each payment adjustment as follows:

$$PA = Q_t \times A$$

where:

PA = Payment adjustment in dollars for asphalt contained in materials placed in the work for a given month.

Q<sub>t</sub> = Sum of quantities of asphalt (Q<sub>h</sub> + Q<sub>rh</sub> + Q<sub>mh</sub> + Q<sub>rap</sub> + Q<sub>tc</sub> + Q<sub>e</sub> + Q<sub>ss</sub> + Q<sub>mab</sub> + Q<sub>o</sub>).

A = Adjustment in dollars per ton of asphalt used to produce materials placed in the work rounded to the nearest \$0.01.

For US Customary projects, use:

A = [(I<sub>u</sub> / I<sub>b</sub>) - 1.05] x I<sub>b</sub> x [1 + (T / 100)] for an increase in the crude oil price index exceeding 5 percent  
A = [(I<sub>u</sub> / I<sub>b</sub>) - 0.95] x I<sub>b</sub> x [1 + (T / 100)] for a decrease in the crude oil price index exceeding 5 percent

For metric projects, use:

A = 1.1023 x [(I<sub>u</sub> / I<sub>b</sub>) - 1.05] x I<sub>b</sub> x [1 + (T / 100)] for an increase in the crude oil price index exceeding 5 percent  
A = 1.1023 x [(I<sub>u</sub> / I<sub>b</sub>) - 0.95] x I<sub>b</sub> x [1 + (T / 100)] for a decrease in the crude oil price index exceeding 5 percent

I<sub>u</sub> = California Statewide Crude Oil Price Index for the month in which the quantity of asphalt subject to adjustment was placed in the work.

I<sub>b</sub> = California Statewide Crude Oil Price Index for the month in which the bid opening for the project occurred

T = Sales and use tax rate, expressed as a percent, currently in effect in the tax jurisdiction where the material is placed. If the tax rate information is not submitted timely, the statewide sales and use tax rate is used in the payment adjustment calculations until the tax rate information is submitted.

### 5-1.06 SURFACE MINING AND RECLAMATION ACT

Imported borrow or aggregate material must come from a surface mine permitted under the Surface Mining and Reclamation Act of 1975 (SMARA), Pub Res Code § 2710, et seq., or from an exempt site.

The Department of Conservation, Office of Mine Reclamation maintains a list of permitted mine sites. For the list of permitted sites, go to:

[http://www.conservation.ca.gov/omr/ab\\_3098\\_list](http://www.conservation.ca.gov/omr/ab_3098_list)

If you import borrow or aggregate material from a surface mine not on this list, submit proof the mine is exempt from SMARA.

### 5-1.07 ELECTRONIC SUBMISSION OF PAYROLL RECORDS

In lieu of submitting weekly payroll records to the Engineer as specified in Section 7-1.01A(3), "Payroll Records," of the Standard Specifications, you may submit weekly payroll records electronically.

Before submitting payroll records electronically, you must complete and sign the Contractor's Acknowledgement and submit it to the District where your project is located. Submit your signed acknowledgement to the corresponding District electronic mailbox shown in the following table:

Electronic Mailboxes	
District	Address
1	<a href="mailto:district1.payrolls@dot.ca.gov">district1.payrolls@dot.ca.gov</a>
2	<a href="mailto:district2.payrolls@dot.ca.gov">district2.payrolls@dot.ca.gov</a>
3	<a href="mailto:district3.payrolls@dot.ca.gov">district3.payrolls@dot.ca.gov</a>
4	<a href="mailto:district4.payrolls@dot.ca.gov">district4.payrolls@dot.ca.gov</a>
5	<a href="mailto:district5.payrolls@dot.ca.gov">district5.payrolls@dot.ca.gov</a>
6	<a href="mailto:district6.payrolls@dot.ca.gov">district6.payrolls@dot.ca.gov</a>
7	<a href="mailto:district7.payrolls@dot.ca.gov">district7.payrolls@dot.ca.gov</a>
8	<a href="mailto:district8.payrolls@dot.ca.gov">district8.payrolls@dot.ca.gov</a>
9	<a href="mailto:district9.payrolls@dot.ca.gov">district9.payrolls@dot.ca.gov</a>
10	<a href="mailto:district10.payrolls@dot.ca.gov">district10.payrolls@dot.ca.gov</a>
11	<a href="mailto:district11.payrolls@dot.ca.gov">district11.payrolls@dot.ca.gov</a>
12	<a href="mailto:district12.payrolls@dot.ca.gov">district12.payrolls@dot.ca.gov</a>

The Department responds with an e-mail containing a Caltrans Internet Certificate to be used for the electronic submission of payroll records. You must agree to accept this certificate and reply to the e-mail. After you accept the certificate and reply to the e-mail, the Department is ready to accept your electronic submissions.

Each electronic submission must:

1. Include payroll records in a nonmodifiable PDF image format. No spreadsheets, word documents, or password protected documents are accepted.
2. Include payroll records with all data elements required by the Labor Code § 1776.
3. Include a signed Statement of Compliance form with each weekly record.
4. Be received by the Department by close of business on the 15th day of the month for the prior month's work.
5. Be encrypted before submission.
6. Contain the following information in the subject line:
  - 6.1. Contract number
  - 6.2. Week ending date as W/E mm/dd/yy
7. Contain 1 contract number and week ending date per submission.

For additional information on electronic submission of payroll records, go to:

<http://www.dot.ca.gov/hq/construc/LaborCompliance/index.htm>

### **5-1.08 RETENTION EXCLUSION**

The Department does not retain moneys from progress payments due to the Contractor for work performed (Pub Cont Code § 7202). The 3rd paragraph in Section 9-1.06, "Partial Payments," of the Standard Specifications does not apply.

### **5-1.09 WORKING DRAWINGS**

Working drawings shall conform to the requirements in Section 5-1.02 "Plans and Working Drawings," of the Standard Specifications and these special provisions. Working drawings shall include supplements and calculations that are in addition to drawings.

Working drawings shall be submitted to the following location:

California Department of Transportation  
Office of the Resident Engineer, Contract 04-0120T4  
345 Burma Rd  
Oakland, CA 94607

Working drawings shall conform to the following:

- A. For initial review, 6 sets of the working drawings shall be submitted. After the Engineer has determined that a submittal is complete, 12 additional sets shall be submitted.
- B. Drawings shall be 559 mm x 864 mm or 279 mm x 432 mm in size. Supplements and calculations shall be 216 mm x 280 mm in size.
- C. For drawings, text size shall be nominally 2.8 mm high, minimum. For supplement and calculations, font size shall be 12, minimum.
- D. Each working drawing sheet and each page of supplement or calculation, shall include the jobsite name of the structure as shown on the contract plans, District-County-Route-Kilometer Post, bridge number and contract number.
- E. Text and details shall be legible and suitable for photocopying and reduction.
- F. In addition to the paper copies of the working drawings, electronic files shall be submitted. Electronic files shall be portable document format (PDF) and shall be submitted on compact disk (CD) media. Each plan sheet shall be a separate PDF file on the CD. The electronic copy of the calculations and supplement shall be made into separate PDF files so that no more than 50 pages are included in a single file on the CD. The CD shall contain an index consisting of the file names and a description of the corresponding file contents. The files shall be listed in the sequence of: 1) index, 2) drawings, 3) supplement, and 4) calculations. If more than one CD is used for a given working drawing submittal, the index shall be included on each CD.
- G. After review and approval of the working drawings, between 6 and 12 sets, as requested by the Engineer, shall be submitted to the Engineer for final approval. These sets will be the only sets stamped "Approved" and will be distributed for use during construction.
- H. At the completion of the contract, one set of reduced prints on 75-g/m2 (minimum) bond paper, 279 mm x 432 mm in size, of the corrected original tracings of all approved working drawings, including all corrections and revisions shall be furnished to the Engineer. Reduced prints that are common to more than one structure shall be submitted for each structure. An index prepared specifically for the drawings for each structure containing sheet numbers and titles shall be included on the first reduced print in the set for each structure. Reduced prints for each structure shall be arranged in the order of drawing numbers shown in the index. In addition to the paper copies electronic files in PDF format on CD media shall be submitted to the Engineer.

When design calculations are required by the Standard Specifications or these special provisions, they shall be prepared and sealed by an engineer who is registered as a Civil Engineer in the State of California. Working drawings developed from these calculations should be similarly sealed by the same engineer. When independently checked calculations are required, these calculations shall be sealed and signed by an engineer who is registered as a Civil Engineer in the State of California and who did not seal and sign the drawings.

Working drawings shall be submitted sufficiently in advance of the start of the affected work to allow time for review by the Engineer and correction by the Contractor of the drawings without delaying the work. The time shall be proportional to the complexity of the work, but in no case shall the time be less than the review time as specified for the type of working drawings as required elsewhere in these special provisions.

The Engineer will review a working drawing submittal for completeness. Within 7 days of the receipt of the submittal by the Engineer, the Engineer will notify the Contractor in writing if the submittal is determined to be incomplete and the submittal will be returned. If the submittal is determined to be complete, 30 working days from

the day of receipt shall be allowed for approval or return for correction, unless specified otherwise in these special provisions. The review time for a set of working drawings will be considered as starting when the Engineer has received a complete set of working drawings and all supporting data.

The review time on a set of returned drawings will be suspended on the date the drawings are date stamped by the Engineer for return. After a revised set of drawings have been received by the Engineer, the new review time for that set of revised drawings will be the original review time, less the time already spent under review before rejection. The revised set shall cover the same work as was originally submitted. In no case shall the review time allotted the Engineer upon receipt of a resubmittal be less than 14 days.

In the event the Engineer fails to complete the review within the time allowed, and if, in the opinion of the Engineer, the Contractor's controlling operation on the critical path is delayed by reason of the Engineer's delay in completing the review, the Contractor will be compensated for any resulting loss, and an extension of time will be granted in the same manner as provided for in the provisions in Section 8-1.07, "Liquidated Damages," of the Standard Specifications and in "Progress Schedule (Critical Path Method)," of these special provisions. Such a delay will be considered a right of way delay and compensation will be granted in the same manner as provided for in Section 8-1.09, "Right of Way Delays," of the Standard Specifications.

#### **5-1.10 FORCE ACCOUNT PAYMENT**

Payment for extra work at force account will be determined by either non-subcontracted or subcontracted force account payment unless otherwise specified.

##### **Non-Subcontracted Force Account Payment**

When extra work to be paid for on a force account basis is performed by the Contractor, compensation will be determined in accordance with Section 9-1.03, "Force Account Payment," of the Standard Specifications and these special provisions.

The second, third and fourth paragraphs of Section 9-1.03A, "Work Performed by Contractor," in the Standard Specifications, shall not apply.

Attention is directed to "Time-Related Overhead" of these special provisions.

To the total of the direct costs for work performed on a force account basis, computed as provided in Sections 9-1.03A(1), "Labor," 9-1.03A(2), "Materials," and 9-1.03A(3), "Equipment Rental," of the Standard Specifications, there will be added the following markups:

Cost	Percent Markup
Labor	30
Materials	10
Equipment Rental	10

The above markups shall be applied to work performed on a force account basis, regardless of whether the work revises the current contract completion date.

The above markups, together with payments made for time-related overhead pursuant to "Time-Related Overhead" of these special provisions, shall constitute full compensation for all overhead costs for work performed on a force account basis. These overhead costs shall be deemed to include all items of expense not specifically designated as cost or equipment rental in conformance with the provisions in Sections 9-1.03A(1), "Labor," 9-1.03A(2), "Materials," and 9-1.03A(3), "Equipment Rental," of the Standard Specifications. The total payment made as provided above and in the first paragraph of Section 9-1.03A, "Work Performed by Contractor," of the Standard Specifications shall be deemed to be the actual cost of the work performed on a force account basis, and shall constitute full compensation therefor.

Full compensation for overhead costs for work performed on a force account basis, and for which no adjustment is made to the lump sum price bid for time-related overhead conforming to the provisions in "Time-Related Overhead" of these special provisions, shall be considered as included in the markups specified above, and no additional compensation will be allowed therefor.

##### **Subcontracted Force Account Payment**

When extra work to be paid for on a force account basis is performed by a subcontractor approved in conformance with the provisions in Section 8-1.01, "Subcontracting," of the Standard Specifications, compensation will be determined in accordance with the provisions in Section 9-1.03, "Force Account Payment," of the Standard Specifications.

### **5-1.11 TIDAL CONDITIONS AND ELEVATION DATUM**

Attention is directed to Section 2-1.03, "Examination of Plans, Specifications, Contract, and Site of Work," of the Standard Specifications.

Tidal conditions may present significant problems in constructing the work as depicted in the contract plans. Tidal fluctuations may be severe and different from those shown in published tidal and current data due to differences in datum, winter runoff and other causes. Strong currents exist over portions of the project site. Limited time periods of slack water may restrict diving and other underwater activities.

The Contractor is responsible for being knowledgeable of such tidal difficulties, and no payment will be made by the State for any costs incurred by the Contractor in connection with the variations in actual tidal or current conditions during the course of this contract. Any reference to Mean High, Mean Higher High and Mean Lower Low tides shall be understood to be an estimate used for permit purposes, actual mean tide data shall be determined by the Contractor. For permit purposes, the limits of the San Francisco Bay have been defined by the Mean High Tide.

All vertical control data are based on the National Geodetic Vertical Datum NGVD of 1929.

### **5-1.12 PAYMENTS**

No partial payment will be made for any materials on hand which are furnished but not incorporated in the work.

In determining the partial payments to be made to the Contractor, only the following listed materials will be considered for inclusion in the payment as materials furnished but not incorporated in the work:

1. Geosynthetic Reinforcement
2. Culvert Pipes
3. Underdrain Pipes
4. Sewer Pipes and Appurtenances
5. Miscellaneous Iron and Steel
6. Chain Link Fence and Gate
7. Fence and Gate (Type Metal)
8. Pipe Handrailing
9. Alternative Crash Cushion
10. Pavement Markers
11. Underground (Electrical)
12. YBI Transition Structures Roadway Westbound (Electrical)
13. YBI Transition Structures Roadway and Girder Eastbound (Electrical)
14. Traffic Operation System (Electrical)
15. YBI Electrical Utility Relocations (Electrical)
16. Removing & Salvaging Electrical Devices
17. Steel Piling
18. Prestressing steel for cast-in-place members (sealed packages only)
19. Prestress anchorages and ducts
20. Precast concrete members
21. PTFE spherical bearings
22. Bar reinforcing steel, including epoxy coated bars
23. Headed bar reinforcement
24. Permanent steel casing
25. Isolation casing and isolation sleeve
26. Miscellaneous metal
27. Bridge deck drainage system
28. Bike path railing
29. Bike path fence
30. Bike path gratings and attachments
31. Steel soldier pile
32. Tieback anchor
33. Timber lagging

Plate steel for fabrication of structural steel and fabricated elements for structural steel fabricated and stored within the United States will be eligible for partial payment if the Contractor furnishes evidence satisfactory to the

Engineer that its storage is subject to or under the control of the Department and that it has been designated or fabricated specifically for this project and is of such character that is not adaptable to any other use.

### **5-1.13 SUPPLEMENTAL PROJECT INFORMATION**

Supplemental project information attached to the project plans are:

1. Log of Test Borings

Supplemental project information included in the Information Handout, and Information available for Inspection are:

#### **INFORMATION HANDOUT**

##### **Structure Information Handout**

1. San Francisco-Oakland Bay Bridge Design Criteria, dated July 15, 2002 by T. Y. Lin International/Moffatt & Nichol Engineers, a Joint Venture
2. Mass Concrete Report dated January 25, 2001 by Ric Maggenti, P.E. Materials & Research Engineer of Caltrans
3. Appendix to Mass Concrete Report: Mass Concrete Pours at Dublin 580/680 Interchange
4. Test Method for Coefficient of Linear Thermal Expansion of Concrete, dated June 1, 1988
5. Notification of California Department of Transportation Qualification Requirement for Ultrasonic Testing Personnel Form
6. Recommendations of CEB-FIP Model Code 1978 for Concrete Structures
7. NCHRP Report 402
8. Integrated Shop Drawing (ISDs) for EB On-Ramp
9. SFOBB Cantilever Truss Inspection Reports
10. Cantilever Truss Original Construction Sequence
11. Eye-Bar Condition Survey
12. SFOBB East Span Design Specifications – Superstructure Circa 1933
13. SFOBB East Span Cantilever Construction Sequence Photographs (1935/1936)
14. Updated Foundation Recommendation for Temporary EB On-Ramp, Yerba Buena Island, SFOBB

##### **Geotechnical Information Handout**

1. Pile Installation Demonstration Project (PIDP) Geotechnical Report: Main Text & Appendices
2. Ground Motion Report: Main Text and Appendices
3. Final Marine Geophysical Survey Report:

Volume-1, Main Text and Appendices

Volume-2, Maps

4. Final Marine Geotechnical Site Characterization Report:

Volume-1, Main Text and Illustrations. Volume-2A through Volume-2H

5. Phase-I Subcontractor Reports - Preliminary Geotechnical Site Characterization:

Volume-1 through Volume-4

6. Phase-II Subcontractor Reports - Preliminary Geotechnical Site Characterization:

Volume-1 through Volume-3

7. Final Yerba Buena Island Geotechnical Site Characterization Report:

Volume-1, Main Text, Volume-2 through 4

8. Geotechnical Foundation Report for the Yerba Buena Island Approach and Self-Anchored Suspension Bridge

9. Geotechnical Report for Design and Construction of Retaining Walls No. 51 and 50A, YBITS#1, Eastern Tunnel Approach (Goat) Slopes, Yerba Buena Island (YBI)
10. Geotechnical Report for Design and Construction of Retaining Walls No. 50, 52, 53, and 55, YBITS#1, Eastern Tunnel Approach (Goat) Slopes, Yerba Buena Island (YBI)
11. Analysis and Design Procedures for Pile Foundations Supporting Temporary Towers Skyway Structures: Main Text & Appendices dated March 2001
12. Revised Final Oakland Shore Approach Geotechnical Site Characterization Report, dated March 2001: Volumes 1, 2A, 2B, 3, and 4
13. Geotechnical Foundation Report for South-South Detour (04-0120R4) Contract
14. Supplemental Geotechnical Data for Design and Construction of Foundations in Eastern Tunnel Approach Slopes, SFOBB, Yerba Buena Island
15. Subsurface Items Constructed in YBITS Advance and Detour work
16. Foundation Report for Access Stairway and Guard Booths, YBI Approach Structure
17. Foundation Recommendation for Shoring Wall, YBI W7 Drainage CCO #75
18. Supplement to Foundation Report for Access Stairway and Guard Booths, YBI Approach Structure
19. Supplement No. 2 to Foundation Report for Access Stairway and Guard Booths, YBI Approach Structure
20. 1920 Geology Reports
21. 1930 Boring Logs for Original Bay Bridge

#### **District Information Handout**

1. Permits, Letters and Agreements, including, but not limited to:
  - 1.1. California Department of Fish and Game (CDFG), Incidental Take Permit No 2081-2001-021-03, Issued November 19, 2001 and Amendments.
  - 1.2. California Regional Water Quality Control Board (RWQCB), Issued January 23, 2002 and RWQCB Order 01-120, Issued October 17, 2001
  - 1.3. United States Army Corps of Engineers (ACOE), Permit No 023013-S, issued December 04, 2001 and Letters of Modification
  - 1.4. San Francisco Bay Conservation Development Commission (BCDC), Permit 8-01, Issued November 20, 2001, and Amendments
  - 1.5. United States Coast Guard, (USCG), Bridge Permit, Bridge Permit No 3-01-11, Dated December 11, 2001
  - 1.6. United States Fish and Wildlife Service (USFWS), Biological Opinion, issued October 29, 2001
  - 1.7. National Marine Fisheries Service (NMFS), Biological Opinion, Issued October 30, 2001, all Supplemental Biological and Conference Opinions
  - 1.8. National Marine Fisheries Service (NMFS), Incidental Harassment Authorizations, and Letters of Authorization
  - 1.9. USCG License No. DTCG-Z71111-03-RP-010L and DTCG Z7111-03-RP-002L dated December 2002, and USCG License No. HSCG-Z71111-09-RP-060L dated July 2009
  - 1.10. Memorandum of Agreement Between the United States Coast Guard and the Department dated June 21, 2001
  - 1.11. Memorandum of Agreement among the Federal Highway Administration, United States Coast Guard, CSHP, and ACHP for the SFOBB project, dated June 2002

The latest versions of environmental permits can be found at the following website:

[www.biomitigation.org](http://www.biomitigation.org)

2. San Francisco-Oakland Bay Bridge East Span Underwater Debris Diagram, dated May 2001
3. SFOBB East Span Survey Information, Control Diagram Dated December 30, 2002
4. USCG Private Aid to Navigation Sample Application Form
5. Geotechnical & Material Report for YBI
6. Site Investigation Report, SFOBB East Span Seismic Safety Project, Yerba Buena Island," Geocon, June 2001
7. Supplemental Site Investigation Report, Yerba Buena Island Duct Bank," Geocon, March 2007
8. Ground Penetration Report No. 6488-01, GEO Vision, November 2006
9. Historical Maps (1917, 1932, 1933)



10. Construction Vibration Monitoring Field Data Form
11. Plot Map titled, Pier 7-Area for Contractor's Use, Quitclaim Easement Deed, and Settlement Agreement
12. Pedestrian Turnstile Installation Manual
13. Contract No. 04-0120Q4 As-Built Plans, regarding USCG guard booth and reinforced concrete canopy, and existing soldier pile retaining wall
14. Pier E1 As-Built Plans
15. USCG Gabion Wall As-Built Plans
16. USCG Parking Canopy As-Built Plans
17. USCG Guard Booth (Entrance Canopy) As-Built Plans
18. Interim Seismic Retrofit-East Bay Cantilever Truss (Contract No. 04-043004)
19. Cantilever Structure-Lower Chord Damage Repair (Contract No. 04-035104)
20. Reconstruction Steel Work East Bay
21. Storm Water Information Handout
22. Bird Management Plan for Bridge Dismantling
23. Underground Classifications No. C091-075-11T (dated February 18, 2011), and Nos. C157-075-11T thru C158-075-11T

### **INFORMATION AVAILABLE FOR INSPECTION**

Items available for inspection, upon written request, at the office of the Duty Senior at the District 4 Office, 111 Grand Avenue, Oakland, CA 94612, email: duty\_senior\_district04@dot.ca.gov, telephone (510) 286-5209 are as follows:

1. Final Environmental Impact Statement/California Environmental Quality Act (CEQA) Statutory Exemption and Record of Decision
2. Order No. 01-100, NPDES General Permit No. CAG912002 from SFRWQCB
3. Cross sections are available in electronic copy in pdf format
4. Soil samples and rock cores
5. Referee samples equal blend of Federal Standard colors No. 27925 and No. 27880
6. Referee samples of Federal Color No. 26099, "Charcoal Gray" and Federal Color No. 26440, "Light Gray", regarding polyester concrete overlay for the bike path.
7. SFOBB East Span, Bridge No. 33-0025 and 33-0006 As-Built Plans.
8. Temporary Bypass Structure, Bridge No. 34-0006 TEMP As-Built: Viaduct, East Tie In, and West Tie In (Phase I and II)

As-built plans of the existing San Francisco-Oakland Bay Bridge East Span, Bridge No. 33-0025 and 33-0006 are available for inspection, upon written request, at the Duty Senior at the District 4 Office, 111 Grand Avenue, Oakland, CA 94612, email: duty\_senior\_district04@dot.ca.gov, telephone number (510) 286-5209, and fax number (510) 622-1805. Requests shall be made on company letterhead and shall include the information requested, the purpose for the information (include contract or permit numbers), and contact information.

When a request to review, inspect, or copy as built plans is approved by the Duty Senior, the Contractor shall provide photo identification and fill and sign a "Confidentiality Agreement Form" with the Department.

The "Confidentiality Agreement Form" is available at the following Internet address:

[http://www.dot.ca.gov/hq/esc/confidentiality\\_agreement.pdf](http://www.dot.ca.gov/hq/esc/confidentiality_agreement.pdf)

When the Contractor's work is finished, the Contractor shall return all obtained as-built plans back to the office of Duty Senior at the District 4 Office, 111 Grand Avenue, Oakland, California 94612, fax number: (510) 622-1805, email: duty\_senior\_district04@dot.ca.gov, telephone (510) 286-5209.

### **5-1.14 INTEGRATED SHOP DRAWINGS**

This work shall consist of developing three-dimensional integrated shop drawings (ISD's) for the following locations, in accordance with the details shown on the plans and the requirements of this section.

1. Pier caps at Piers W7, W8, W9 and W10
2. Utility Penetrations at Piercap and Hinge Diaphragms
3. Hinge W6RB and W8B
4. Abutment end diaphragm

5. Bike path beams interface with the superstructure at girder, piercap, intermediate diaphragms, hinges and abutment end diaphragms

Difficult construction is anticipated at locations that are highly congested with reinforcing steel, post-tensioning strand tendons, anchor bolts, and other concrete embedded items as shown on the plans. It is anticipated that various dimensional conflicts may be encountered between the planned locations of these embedded items.

ISD's shall conform to Section "Working Drawings" of these special provisions. ISD's shall be composite placing drawings to scale and in sufficient detail to show the relative positions of all items that are to be embedded in the concrete and their embedment depth as necessary to demonstrate compatibility of items within the concrete. ISD's shall be prepared under the supervision of an engineer who is registered as a Civil Engineer in the State of California.

The Contractor shall field measure locations of reinforcement at existing columns and modular joint blockouts and utilize these measurements in the preparation of related bent cap ISD's.

Prior to commencing work on the ISD, the Contractor (including any sub-consultants hired to work on the ISD) shall attend a meeting with the Engineer to discuss the ISD work. ISD status meetings shall be held regularly, or as required by the Engineer, to discuss the progress of the ISD work.

The Contractor shall utilize commercially available software that checks for interference in three dimensions to identify any conflicts in the planned positions of embedded items in the ISD's. The software shall be compatible with the computer-aided drafting (CAD) software used to develop the ISD's. Prior to acquiring the software, the Contractor shall submit to the Engineer the product name and application features of the software for review and approval. Bar reinforcement shall be shown with deformed diameters. The Contractor shall develop CAD files using different layers for each type of embedded item such that the sequence of construction of the member or area being detailed can be shown.

Embedded items that are to be shown on the ISD's shall include but are not limited to, the following:

1. Prestressing ducts and anchorages
2. Bar reinforcing steel and splices including lap, welded, and mechanical splices
3. Anchor bolts
4. Anchor bolt plates
5. Grout vents
6. Modular joints
7. Drainage pipe
8. Utility conduits and openings
9. Inserts, bolt sleeves and studs
10. Headed bars
11. Epoxy coated bars
12. Other items, as shown on the plans or added by the Contractor

The Contractor shall use three-dimensional ISD's to identify and propose resolution of all conflicts and interference between the planned positions of embedded items and to satisfy the concrete cover shown on the plans.

If a conflict is identified, the Contractor shall document the conflict and propose changes to the embedded items in the ISD's to resolve the conflict. Proposed changes to the embedded items shall be made by a licensed engineer practicing Civil Engineering with extensive previous experience developing ISD.

The Contractor's proposed changes in the ISD's shall comply with the following sequence of item adjustments:

1. Non structural embedded items
2. Reinforcing steel including headed bar reinforcement and epoxy coated reinforcement
3. Transverse prestressing ducts
4. Bearing anchor bolts

For conflicts involving bar reinforcing steel that cannot be resolved by adjusting nonstructural embedded items, the Contractor shall apply the following sequence of adjustments in order as necessary and as approved by the Engineer:

1. Adjust reinforcement spacing
2. Bundle bars
3. Relocate splices
4. Change reinforcement size and number. Reduction of the total reinforcement area will not be permitted unless otherwise permitted by the Engineer

5. Change reinforcement shape
6. Move embedded inserts
7. Cut/trim reinforcement
8. Combination of all the above

The ISD's to be submitted to the Engineer shall include the following:

1. Baseline/Conflict Identification ISD: Three sets of the ISD's corresponding to the details as shown on the plans without any modifications. These ISD's shall indicate all conflicts including locations of the conflicts and items involved in the conflicts.
2. Conflict List: Three complete lists of conflicts with descriptions and the Contractor's proposed modifications for each conflict.
3. Proposed Modifications ISD: Three sets of the ISD's corresponding to the details as shown on the plans with incorporation of the Contractor's proposed modifications. These ISD's shall indicate that all previous identified conflicts have been resolved and concrete cover requirements as shown on the plans are met.
4. ISD submittal shall be in two-dimensional format utilizing the three-dimensional layouts as input. ISD's shall be 260 mm x 432 mm in size and shall use colored ink to differentiate each type of embedded items.
5. Three copies of the ISD's in electronic form on compact discs or tape for use by the Engineer.

An ISD submittal that complies with all of the above requirements, in the opinion of the Engineer, will be defined as a complete ISD submittal. Isometric drawings, if submitted, shall in no way relieve the Contractor from any other working drawing submittal required by these special provisions or the Standard Specifications.

CAD files of the contract drawings will not be made available to the Contractor.

After an ISD submittal is received by the Engineer, the Contractor shall allow the Engineer 7 days to review the ISD submittal for completeness. If determined to be complete, the Engineer shall have 28 days from the day of receipt to review and approve the ISD submittal. For proposed modifications that are not approved by the Engineer, the Engineer will propose alternative modifications to the Contractor. Modifications that result in changes to the plans or specifications, as determined by the Engineer, will be made in accordance with Section 4-1.03, "Changes," of the Standard Specifications. The Contractor shall submit revised ISD's incorporating the Engineer's alternative modifications as specified in this section. For each revised ISD submitted by the Contractor, the Contractor shall allow the Engineer an additional 2 weeks for review and approval. If more than one ISD is submitted at one time, the time to be allowed for the review of the ISD shall not be less than the review time specified above plus 14 days for each ISD submittal still under review and the Contractor shall designate the sequence in which the submittals are to be reviewed.

Construction of the items at locations listed above and adjacent areas shall not begin until the Engineer reviews and approves the complete ISD submittal with all conflicts resolved.

No extension of time will be permitted for the Contractor's failure to identify all conflicts or to complete the ISD's as required by these special provisions.

Full compensation for preparing ISD's, including ISD status meetings, computer software as described in this section, and all revisions necessary due to conflict resolution measures described in this section, shall be considered as included in the contract prices paid for the various items of work involved and no additional compensation will be allowed therefor.

#### **5-1.15 COST REDUCTION INCENTIVE PROPOSALS**

Cost Reduction Incentive Proposals (CRIP) shall conform to the provisions in Section 4-1.035B, "Value Engineering Change Proposals," of the Standard Specifications and these special provisions.

Attention is directed to "Description of Bridge Work" of these special provisions for the description of basic design of the bridge.

The Contractor shall reimburse the Department's costs for investigating and reviewing a CRIP including the preliminary concept of a CRIP regardless of whether it is approved or rejected. The Contractor shall indicate acceptance thereof in writing, and that acceptance shall constitute full authority for the Department to deduct amounts payable to the Department from any moneys due or that may become due to the Contractor under the contract.

No proposals will be permitted in the following:

- A. Structure Type and Cross Sections
- B. Number and Location of Hinges
- C. Span Lengths
- D. Slope of Exterior Girder

- E. Box Girder Exterior Dimensions
- F. Exterior Dimensions of Bridge Superstructure
- G. Exterior Dimensions of Bridge Columns
- H. Bent Cross-Sections
- I. Pile Dimensions and Layout
- J. Footing Type and Dimensions
- K. Specified Pile Tip Elevations
- L. Minimum Hammer Energy
- M. Welding Requirements and Procedures
- N. Bike path Structure

The Contractor shall submit the preliminary concept of proposed CRIP in writing to the Engineer for approval prior to proceeding with the complete CRIP. After submitting the preliminary concept of proposed CRIP, the Contractor shall request a meeting with the Engineer to discuss the proposal in concept and to determine whether the cost reduction proposal will be considered by the Department. Items of discussion will include permit issues, impact on other projects, impact on the project schedule, traffic considerations, safety and health issues, design criteria, and review times required by the Department and other agencies. Determination by the Engineer that a cost reduction proposal will not be considered further will be deemed rejection of the proposal. The Contractor shall allow 15 working days after the meeting for the Engineer to review the conceptual submittal. Acceptance of a conceptual submittal in no way constitutes approval nor guarantees future approval of the Contractor's CRIP.

If the proposed CRIP affects the seismic performance of the structure, as determined by the Engineer, the Contractor shall present the CRIP proposal to the Seismic Safety Peer Review Panel (SSPRP). It is anticipated that this presentation to the SSPRP will require a 2-month notice and 6 meetings (occurring once a month). The meeting location(s) will be in California, and the meeting location and schedule will be determined by the SSPRP. The Engineer will not further consider said CRIP unless it is approved by the SSPRP. The Contractor's cost of preparing the SSPRP presentation and attending the SSPRP meetings and the Department's costs of investigating said proposal, presentation, meeting attendance, and compensation to the SSPRP, including any portion thereof paid by the Contractor, shall be excluded from consideration in determining the estimated new savings in construction costs.

No extension of time and no delay will be granted for the development, submittal, investigation, and review of CRIPs.

#### **5-1.16 SOUND CONTROL REQUIREMENTS**

Sound control shall conform to these special provisions.

Attention is directed to "Supplemental Project Information," of these special provisions for reference to the USCG License HSCG-Z91111-09-RP-060L, Maintenance and Logistic Command Pacific.

The noise level from the Contractor's operations, between the hours of 7:00 p.m. and 7:00 a.m., shall not exceed 78 dBA at a distance of 15 m from the source. Impact-type mechanical operations generated from the bridge removal, and jack-hammering shall not be conducted between the hours of 7:00 p.m. and 7:00 a.m. In addition, pile-driving shall not be conducted between the hours of 7:00 p.m. and 12:00 p.m. At all times, the Contractor shall be responsible for complying with local ordinances regulating noise levels as well as the sound requirements of this section.

Noise monitoring activities will be conducted by the Department. The Contractor shall coordinate with the Department monitors and allow them access to noise monitoring locations.

The Contractor shall provide one "Type 1" sound level meter and one acoustic calibrator, which will be used by the Department during the life of the contract, at least 30 days prior to the start of construction. The Contractor shall provide training by a person trained in noise monitoring to one Department employee designated by the Engineer. The sound level meter shall be calibrated and certified by the manufacturer or other independent acoustical laboratory prior to delivery to the Department. The Contractor shall provide annual recalibration by the manufacturer or other independent acoustical laboratory. All equipment shall be capable of taking measurements using the A-weighting network and the "slow" response of the sound level meter. The measurement microphone shall be fitted with an appropriate windscreen. All equipment shall be returned to the Contractor at the acceptance of the contract. Equipment damaged by actions of the Department or the public shall be paid for as extra work as provided in Section 4-1.03D for the Standard Specifications.

Each internal combustion engine, used for any purpose on the job or related to the job, shall be equipped with a muffler of a type recommended by the manufacturer. No internal combustion engine shall be operated on the project without the muffler.

The noise level requirement shall apply to the equipment on the job or related to the job, including but not limited to trucks, transit mixers or transient equipment that may or may not be owned by the Contractor. The use of

loud sound signals shall be avoided in favor of light warnings except those required by safety laws for the protection of personnel.

Full compensation for conforming to the requirements of this section shall be considered as included in the prices paid for the various contract items of work involved and no additional compensation will be allowed therefor.

#### 5-1.17 SPECIES PROTECTION

##### GENERAL

###### Summary

This work includes protecting regulated species or their habitat.

This project is within or near habitat for regulated species:

Central California Coast Coho Salmon ( <i>Oncorhynchus kisutch</i> )
Central California Coast Steelhead ( <i>Oncorhynchus mykiss</i> )
Central Valley Spring Run Chinook Salmon ( <i>Oncorhynchus tshawytscha</i> )
Central Valley Steelhead ( <i>Oncorhynchus mykiss</i> )
Green Sturgeon ( <i>Acipenser medirostris</i> )
Sacramento River Winter Run Chinook Salmon ( <i>Oncorhynchus tshawytscha</i> )
Longfin Smelt ( <i>Spirinchus thaleichthys</i> )
Pacific Herring ( <i>Clupea pallasii</i> )
California Sea Lion ( <i>Zalophus californianus</i> )
Harbor Porpoise ( <i>Phocoena phocoena</i> )
Gray Whale ( <i>Eschrichtius robustus</i> )
Pacific Harbor Seal ( <i>Phoca vitulina richardii</i> )
American Peregrine Falcon ( <i>Falco peregrinus anatum</i> )
California Brown Pelican ( <i>Pelecanus occidentalis californicus</i> )
California Least Tern ( <i>Sterna antillarum browni</i> )
Double-Crested Cormorant ( <i>Phalacrocorax auritus</i> )
Western Gull ( <i>Larus occidentalis</i> )

##### CONSTRUCTION

###### Protective Radius

Upon discovery of a regulated species, stop construction activities within a 30 meter radius of the discovery or as defined in the table below. Immediately notify the Engineer. Do not resume activities until receiving written notification from the Engineer.

Regulated Species Name	Protective Radius
Pacific Herring	200 meter
Migratory Birds	76 meter

###### Protocols

Use protocols required by PLACs or, when not specified, use:

Regulated Species Name	Protocol
Migratory Birds	Bird Management Plan For Bridge Dismantling

###### Biological Resource Information

Implement the following Biological Resource Information requirements:

1. Before installation of any piles, all personnel involved with pile driving must be briefed by the Department Biologist regarding responsibilities, communication procedures, biological monitoring protocols, and operational procedures. The briefing will be held at the Bay Bridge Field Office at Pier 7 in Oakland and will take a maximum of two hours.

### **Monitoring Schedule**

Monitor according to the following schedule:

Monitoring Type	Schedule
Migratory bird monitoring January 1 <sup>st</sup> to August 31 <sup>st</sup>	Monitor at least during a 7-days period. One monitoring event must take place on a Saturday or Sunday.
Migratory bird monitoring September 1 <sup>st</sup> to December 31 <sup>st</sup>	Monitor one day per week

### **MEASUREMENT AND PAYMENT**

Full compensation for Species Protection is included in the contract lump sum price paid for Contractor Supplied Biologist and no additional compensation will be allowed therefor.

#### **5-1.18 BIRD PROTECTION PLAN**

##### **GENERAL**

###### **Summary**

This work includes preparing a plan to protect biological resources.

###### **General Requirements**

Prepare a Bird Protection Plan that defines measures you will take to maintain project compliance with environmental laws, and the requirements in "Permits, Licenses, Agreements, and Certifications (PLACs)," of these special provisions.

Comply with the requirements of "Species Protection."

###### **Submittals**

Bird Protection Plan: Within 15 days after contract approval, submit the Bird Protection Plan to the Engineer. Allow 15 days for the Engineer's review. If the submittal is incomplete, the Engineer will provide comments. Within 7 days after receiving the Engineer's comments, update and submit the Bird Protection Plan to the Engineer. The Bird Protection Plans shall be updated and resubmitted annually, no later than January 15 during each year of construction.

###### **Quality Assurance**

The Bird Protection Plan must be prepared and signed by a biologist knowledgeable of the species or habitats discussed and address species protection measures.

###### **Quality Control**

At minimum, the Bird Protection Plan includes:

- Information and protection measures consistent with the Bird Management Plan for Bridge Dismantling (provided in Information Handout)
- List of bird species and nesting habitats expected in the project area
- Protection measures for regulated bird species likely to occur in the project site
- Protective radii for regulated bird species encounters
- Implementation plan for protection measures, including monitoring schedule
- Monitoring duties
- Justification for each instance where protection measures and an implementation plan are not necessary for a regulated bird species
- Schedule for inspecting bird protection and exclusion measures
- Schedule for maintaining bird protection and exclusion measures
- Schedule for submittal of monitoring reports
- Response plan for instances where occupied nests are encountered
- Location and schedule of bird protection and exclusion measures to be implemented over the life of the project

## **MEASUREMENT AND PAYMENT**

Full compensation for Bird Protection Plan is included in the contract lump sum price paid for Contractor Supplied Biologist and no additional compensation will be allowed therefor.

### **5-1.19 BIRD PROTECTION**

#### **GENERAL**

This work includes protecting migratory and nongame birds, their occupied nests, and their eggs.

Nesting or attempted nesting by migratory and nongame birds is anticipated to occur but is not limited to February 1<sup>st</sup> through August 31<sup>st</sup>.

#### **QUALITY ASSURANCE**

##### **Regulatory requirements**

The Federal Migratory Bird Treaty Act (16 USC §703-711.), 50 CFR 10, and Fish & Game Code §3503, §3513, and §3800, protect migratory and nongame birds, their occupied nests, and their eggs.

The Federal Endangered Species Act of 1973 (16 USC §1531, §1543) and California Endangered Species Act (Fish & Game Code §2050-§2115.5) prohibit the take of listed species and protect occupied and unoccupied nests of threatened and endangered bird species.

The Bald Eagle Protection Act (16 USC §668) prohibits the destruction of bald and golden eagles occupied and unoccupied nests.

Permits are included in the Project Information handout.

#### **CONSTRUCTION**

When migratory or nongame bird nests are discovered which may be adversely affected by construction activity, or when a bird is found injured or killed as a result of construction activity, immediately stop work within 76 meters of the nest or bird and notify the Engineer. Work must not resume until the Engineer provides written notification that work may resume at that location.

When ordered by the Engineer, use exclusion devices, nesting prevention measures or remove and dispose of partially constructed and unoccupied nests of migratory or nongame birds on a regular basis to prevent their occupation.

Nest removal activities must not result in depositing into or allowing materials to enter waters of this state.

## **MEASUREMENT AND PAYMENT**

Exclusion devices, nesting prevention measures and nest removal that are ordered by the Engineer will be paid for as extra work as specified in Section 4-1.03D, "Extra Work," of the Standard Specifications.

A delay to the controlling operation due to migratory or nongame birds or their nests will be considered a temporary suspension of work under Section 8-1.05, "Temporary Suspension of Work," of the Standard Specifications. Adjustments will be made for delays that the Engineer determines are not due to the Contractor's failure to perform the provision of the contract in the same manner as for suspensions due to unsuitable weather in Section 8-1.05.

### **5-1.20 RELATIONS WITH CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD**

This project lies within the boundaries of the San Francisco Bay Regional Water Quality Control Board (RWQCB).

The State Water Resources Control Board (SWRCB) has issued to the Department a permit that governs storm water and non-storm water discharges from the Department's properties, facilities, and activities. The Department's permit is entitled "Order No. 99 - 06 - DWQ, NPDES No. CAS000003, National Pollutant Discharge Elimination System (NPDES) Permit, Statewide Storm Water Permit and Waste Discharge Requirements (WDRs) for the State of California, Department of Transportation (Caltrans)." Copies of the Department's permit are available for review from the SWRCB, Division of Water Quality, 1001 "I" Street, P.O. Box 100, Sacramento, California 95812-0100, Telephone fax: (916) 341-5463 and may also be obtained at:

[http://www.waterboards.ca.gov/water\\_issues/programs/stormwater/caltrans.shtml](http://www.waterboards.ca.gov/water_issues/programs/stormwater/caltrans.shtml)

The Department's permit references and incorporates by reference the current statewide general permit issued by the SWRCB entitled "Order No. 2009-0009-DWQ, National Pollutant Discharge Elimination System (NPDES) General Permit No. CAS000002, Waste Discharge Requirements for Discharges of Storm Water Runoff Associated with Construction and Land Disturbance Activities" that regulates discharges of storm water and non-storm water

from construction activities disturbing one acre or more of soil in a common plan of development. Copies of the statewide permit and modifications thereto are available for review from the SWRCB, Division of Water Quality, 1001 "I" Street, P.O. Box 100, Sacramento, California 95812-0100, Telephone fax: (916) 341-5463 and may also be obtained at:

[http://www.waterboards.ca.gov/water\\_issues/programs/stormwater/construction.shtml](http://www.waterboards.ca.gov/water_issues/programs/stormwater/construction.shtml)

The San Francisco Bay RWQCB has issued a permit which governs storm water and non-storm water discharges resulting from construction activities in the project area. The RWQCB permit is entitled Waste Discharge Requirements, Permit No. Order No. R2-2002-0011." Copies of the RWQCB permit are available for review from Caltrans District 4.

The NPDES permits that regulate this project, as referenced above, are collectively referred to in this section as the "permits."

This project shall conform to the permits and modifications thereto. The Contractor shall maintain copies of the permits at the project site and shall make them available during construction.

The Contractor shall know and comply with provisions of Federal, State, and local regulations and requirements that govern the Contractor's operations and storm water and non-storm water discharges from the project site and areas of disturbance outside the project limits during construction. Attention is directed to Sections 7-1.01, "Laws to be Observed," 5-1.18, "Property and Facility Preservation," 7-1.12, "Indemnification and Insurance," and 9-1.07E(5), "Penalty Withholds," of the Standard Specifications.

The Contractor shall notify the Engineer immediately upon request from the regulatory agencies to enter, inspect, sample, monitor, or otherwise access the project site or the Contractor's records pertaining to water pollution control work. The Contractor and the Department shall provide copies of correspondence, notices of violation, enforcement actions, or proposed fines by regulatory agencies to the requesting regulatory agency.

#### **5-1.21 RELATIONS WITH SAN FRANCISCO BAR PILOTS**

This project is located in the Bay of San Francisco, in which the Contractor's shipping vessels and waterborne operations may be under the jurisdiction of the San Francisco Bar Pilots. Attention is directed to Division 5, "Pilots for Monterey Bay and the Bays of San Francisco, San Pablo, and Suisun" of the California Harbors and Navigation Code. The Contractor shall have knowledge of and comply with the requirements of the California Harbors and Navigation Code.

Full compensation for conforming to the requirements of the San Francisco Bar Pilots shall be considered as included in the contract prices paid for the various contract items of work and no additional compensation will be allowed therefor.

#### **5-1.22 RELATIONS WITH UNITED STATES COAST GUARD**

This project is located in San Francisco Bay at Yerba Buena Island (YBI), and is under the jurisdiction of the United States Coast Guard (USCG), Eleventh District, Coast Guard Island, Alameda, California, 94501-5100.

Attention is directed to "Supplemental Project Information," and "Permits, Licenses, Agreements, and Certifications," of these special provisions.

A USCG License and a USCG Bridge Permit have been issued covering work to be performed under this contract. The Contractor shall be fully informed of all rules, regulations, terms and conditions that may govern the Contractor's operations within the construction right-of-way and shall conduct the Contractor's work accordingly. Copies of both the License and the Bridge Permit are included in the Information Handout and are part of the contract requirements.

The Contractor's attention is directed to Sections 7-1.01, "Laws to be Observed," 7-1.11, "Preservation of Property," and 7-1.12, "Indemnification and Insurance," of the Standard Specifications, and to the provisions in "Sound Control Requirements" of these special provisions.

The Contractor's attention is directed to the following procedures to meet the conditions which are among those established by the USCG Permit in the work authorization for this project:

1. **Navigation.**--At least 50 calendar days before anchoring barges or constructing temporary support structures, including docks and trestles within the construction right-of-way, or as directed by the Engineer, the Contractor shall notify the Engineer, in writing, along with drawings, of their proposed method for anchoring barges and of the location temporary support structures, including docks and trestles. The Engineer will transmit the Contractor's proposal to the USCG for approval. The Contractor shall not anchor any barges until their procedure has been approved by the USCG. In the event that the required



USCG approval, in the opinion of the Engineer, delays the Contractor's operations, the Contractor will be granted a time extension commensurate with the delays. No barges can be anchored within the ESAs.

Brief full channel closures are an inconvenience to vessel traffic and will only be permitted if and when approved by the USCG. Among other requirements for a full channel closure that may be required by the USCG, the Contractor may be required to provide assistance to vessels to safely pass through the falsework or to circumnavigate YBI. The Contractor shall minimize the number and duration of any requested full channel closures. The Contractor shall propose any full channel closures to the Engineer in writing 50 days in advance of any full channel closure. The Engineer will transmit the Contractor's proposal to the USCG for approval. The proposal shall contain the schedule of the closure, activities required during the closure, and contingency plans. The contingency plans shall include provisions for rapid reopening of the channel, as well as plans for notifying vessels of the closure and providing assistance for vessels to safely pass through the falsework or circumnavigate Yerba Buena Island. Any effort expended by the contractor to get approval for a full channel closure or to comply with any of the requirements of the USCG's approval shall be at the Contractor's expense.

2. **Aids to Navigation.**--The Contractor shall coordinate with the USCG Commander, Eleventh Coast Guard District, Building 50-6, Coast Guard Island, Alameda, California 94501-5100, Telephone (510) 437-2983 for written authorization at least 60 calendar days prior to any relocation or temporary removal of any aids to navigation within or near any areas involved with dredging or construction. In addition, the Contractor shall not obstruct, willfully damage, make fast to, or interfere with any aid to navigation.
3. **Navigational Obstructions.**--Any debris, material, plant or machinery that are incidentally dropped into the waters of the Bay during the progress of work, which may present a hazard or which may obstruct navigation shall be promptly recovered or removed. Floating objects shall be immediately recovered or tied down and marked, so that they do not present hazards to navigation. The Contractor shall give immediate notice of in-place obstructions to the proper authorities and shall mark or buoy such obstructions until they are removed. Should the Contractor neglect or delay compliance with the above requirements, such obstructions shall be removed by the Department of Transportation and the cost of such removal will be deducted from the moneys due to the Contractor or may be recovered from their bond.
4. **Navigational Lighting.**--The Contractor shall keep proper warning lights each night between the hours of sunset and sunrise upon all floating equipment, falsework connected with the work and all buoys which are of a size and location as to endanger or obstruct navigation. The Contractor shall provide suitable navigational lighting at any time that construction operations obstruct the waterways. All floating equipment shall be marked in accordance with USCG Regulations.
5. **Nighttime Lighting.**--The Contractor shall direct lighting on to the immediate area under construction and avoid shining lights towards residences on YBI and marine traffic. The Contractor shall also not shine lights into the water at night.
6. **Temporary Support Structures.**--Following the completion of construction, the Contractor shall remove all temporary support structures, including docks and trestles. Pilings shall be removed and shall be cut off at least 1.0 meter below the original mudline in-bay, and 1.0 meter below the original ground in-land.

The Contractor shall be aware of the USCG facility on the southeast side of YBI, and be aware of the USCG License provisions regarding unrestricted and emergency access to its properties on YBI. The Contractor shall submit for review and approval, to the Engineer and the USCG, a contingency plan that will provide the USCG the emergency access required through the entire project site at all times during construction.

Attention is directed to Section 8-1.06, "Time of Completion," of the Standard Specifications. Days during which the Contractor's operations are restricted in the navigation channel by others shall be considered to be nonworking days if, in the opinion of the Engineer, these restrictions cause a delay in the current controlling operation or operations.

## **PAYMENT**

Full compensation for conforming to the requirements of the relations with USCG shall be considered as included in the contract prices paid for the various contract items of work and no additional compensation will be allowed therefor.

## 5-1.23 ENVIRONMENTALLY SENSITIVE AREAS

### A. ENVIRONMENTALLY SENSITIVE AREAS

Environmentally sensitive areas (ESA) shall consist of areas within and near the limits of construction where access is prohibited or limited for the preservation of archaeological site, historic architectural resource or existing vegetation, or protection of biological habitat as shown on the plans. The Engineer will determine the exact location of the boundaries of the ESAs. Access is prohibited and no work shall be conducted within the ESAs, except ESAs 1a and 1b:

#### 1. ESA 1a and 1b

ESA 1a consists of asphalt concrete paved area and unpaved slope area.  
ESA 1b is located within the asphalt concrete paved area.

The boundaries of the paved areas of the ESAs 1a and 1b shall be marked with a 200-mm white thermoplastic delineation or alternative markings approved by the Engineer.

Within the paved areas and delineated boundaries of the ESAs 1a and 1b (which includes area to be monitored (ATM)), no work involving asphalt removal or earth disturbance and/or removal, including driving posts for fencing, signing, or utility trenching, shall be allowed without prior approval by the Engineer in consultation with the Department Archaeologist. The Engineer will contact Department Archaeologist at least 5 days prior to start of work. Limited access to these ESAs may be allowed for vehicle and equipment access, storage or transport of materials or equipment vehicle or equipment access, storage and stockpiling, or transport of materials, when approved in writing by the Engineer in consultation with the Department Archaeologist.

Within the unpaved slope area of ESA 1a, no work involving earth disturbance, including driving posts for fencing, or signing, shall be allowed without prior approval by the Engineer in consultation with the Department Archaeologist. The Contractor shall submit to the Engineer the protection plans including the scope of the work, in conformance with the requirements in "Working Drawings," of these special provisions. The Contractor equipment access will not be allowed, unless the Contractor has obtained a written approval from the Engineer in consultation with the Department Archaeologist.

#### 2. ESA 2a, 2b, and 2c

- 2.1. ESA 2a consists of Building No. 262 (Torpedo Factory), Historic Architectural Resource
- 2.2. ESA 2b consists of the Senior Officers' Quarters Historic District (Quarters 1 through 7), Historic Architectural Resource, and grounds.
- 2.3. ESA 2c consists of Quarters 8, and grounds.  
Within the area of ESA 2c, no work shall be allowed, unless the Contractor has obtained a written approval from the Engineer, and an approved protection plan to perform the following work as shown on the plans from the Engineer: to remove base and surfacing, remove concrete stair, remove retaining wall, remove fence, and construct sidewalk. The protection plan shall conform to the requirements in "Working Drawings," of these special provisions.

- 3. ESA 3, Quarters 10, Building 267 (garage), and grounds.
- 4. ESA 5, Vegetation, Environmentally Sensitive Areas, including mature vegetation screen located on slope southwest of Quarters 1 (Nimitz House), and pittosporum trees
- 5. ESA 6, Tidal wetlands, water-based ESA (by others), located on the north side of YBI
- 6. ESA 7, Eelgrass beds, water-based ESA (by others), located on the south sides of YBI
- 7. ESA 8, Eelgrass beds, water-based ESA (by others), located on the north sides of YBI
- 8. ESA 9a and 9b, concrete retaining walls and weir, Historic Architectural Resource

Attention is directed to Section 7—1.01 "Laws to be Observed," of the Standard Specifications, and in "Permits, Licenses, Agreements, and Certifications," of these special provisions, regarding State and Federal regulations, permits, or agreements which pertain to an ESA.

Water-based ESA boundaries have been marked with USCG-approved buoys, and have been established and will be maintained by others.

Land-based ESA boundaries shall be clearly marked by either the installation of Temporary Fence (Type ESA) or thermoplastic pavement delineation as specified elsewhere in these special provisions. The boundaries shall be checked periodically and the markings repaired or replaced as necessary during construction.

Within the boundaries of land-based ESAs 1a (unpaved area), ESAs 2b and 2c, ESA 3, ESA 5, and ESA 9a and 9b and water-based ESAs 6, 7, and 8, no project related activities shall take place, without the written approval from the Engineer. This specifically prohibits construction personnel, vehicle and barge access, storage or transport of any materials, including hydrocarbon and lead contaminated material, or any other project related activities. The Contractor shall take such measures, including the posting of written notices to his employees and subcontractors, to ensure that ESAs are not entered or disturbed.

The Contractor shall mitigate damage or impacts to the ESAs caused by the Contractor's operations, at the Contractor's expense in accordance with Section 7-1.11, "Preservation of Property," of the Standard Specifications. Any additional mitigation assessed to the Department will be the responsibility of the Contractor. If necessary, deductions from moneys due or to become due the Contractor will be made for the mitigation costs.

#### **B. AREA TO BE MONITORED (ATM)**

The Department Archaeologist will monitor the delineated ATM area.

No construction activities involving asphalt removal or earth disturbance and/or removal shall be allowed within the ATM area shown on the plans, unless the Contractor has obtained a written approval from the Engineer.

The Contractor shall obtain the Engineer's approval in writing at least 20 days in advance of the beginning of the removal of the top 0.6-m in depth of roadway excavation within the ATM, in order to have the Department Archaeologist begin to mobilize.

#### **CONSTRUCTION**

The Department Archaeologist shall have the authority to halt construction operations in the vicinity of an archaeological find, if significant or potentially significant cultural resources are exposed or if the find will be adversely affected by construction operations.

In the event that human skeletal material or archaeological resources are uncovered within the ATM area and/or contract limits, the Contractor shall immediately notify the Engineer, who in turn will notify the Department Archaeologist and the State may conduct an archaeological investigation. The Contractor's construction activities within 15 meters of the find shall be halted immediately and shall not be resumed until so permitted, in writing by the Engineer.

When determined by the Department Archeologist that an archeological investigation is required, and as requested by the Engineer, the Contractor shall provide construction equipment and operators and/or laborers and shall cooperate with and assist Department Archaeologist(s) in their conducting of any of the archaeological work, if necessary.

The Contractor shall provide, within 24 hours at the request of the Engineer:

1. A grading bucket with flat blade.
2. Suitable access/egress ramp or ladders or stairs in the ATM area as directed by the Engineer.

The above equipment and material items required for the archaeological work as specified in this section will be paid for as extra work as provided in Section 4-1.03D of the Standard Specifications.

If, in the opinion of the Engineer, the Contractor's operations are delayed or interfered with by reason of such discoveries, the State will compensate the Contractor for the delays to the extent provided in Section 8-1.09, "Right of Way Delays," of the Standard Specifications, except as provided in Section 8-1.10, "Utility and Non-Highway Facilities," of the Standard Specifications.

#### **C. SPECIAL CONSTRUCTION AREA (SCA)**

The special construction area is designated as the landscaping restoration area to be constructed as shown on the plans.

The Contractor will be allowed inside SCA area. The Contractor shall not encroach into the designated ESA area bounded by ESA 2b, the Senior Officers' Quarters Historic District (Quarters 1 through 7), as shown on the plans. Damages to the existing pavement, sidewalk and curb caused by the Contractor's operations, shall be replaced in kind at the Contractor's expense.

## PAYMENT

Full compensation for checking, repairing or replacing the land-based ESA marking shall be considered as included in the contract price paid for various items of work involved and no separate payment will be made therefor.

Full compensation for protecting and submitting the protection plan for the ESA 1a and ESA 2c shall be considered as included in the contract price paid for various items of work involved and no separate payment will be made therefor.

### 5-1.24 PRESERVE HISTORICAL BUILDINGS

Existing listed facilities as shown on the plans are historical buildings, and must be preserved in compliance with the provisions in Section 5-1.18, "Property and Facility Preservation," of the Standard Specifications, and these special provisions:

1. Building No. 262 (Torpedo Factory), Historic Architectural Resource, (ESA 2a)
2. United States Navy – The Senior Officers' Quarters Historic District (Quarters 1 through 7), Historic Architectural Resource, and grounds (ESA 2b)
3. Quarters 8, and grounds, (ESA 2c)
4. United States Coast Guard Base – Quarters 9, B, C, 10, 24, 25, 26,27, and 267 (garage)
5. Concrete Retaining Walls and Weir, Historic Architectural Resource, (ESA 9a, and 9b)

Attention is directed to "Photo Survey of Existing Facilities," and "Vibration Monitoring," of these special provisions, regarding historical buildings.

The Contractor must take measures to protect historical buildings from damage caused by the Contractor's operations. The Contractor shall submit a building protection plan for the Engineer's review at least 30 days prior to the start of adjacent construction within 26 meters of the historical building or overhead construction. The Contractor shall also notify the Engineer at least 48 hours prior to the start of adjacent or overhead construction.

Should any damage to the historical buildings occur, the Contractor must notify the Engineer within 24 hours. The Engineer may order the suspension of construction operations until the Contractor takes all necessary measures to prevent further damage to the building, and until an approved repair is completed. The Contractor must submit a repair plan to the Engineer for approval prior to the start of such work. The Engineer will review the plan within 90 days. All repairs must comply with the Secretary of the Interior's Standards for the Treatment of Historic Properties. The repair plans must be prepared and sealed by a licensed preservation architect who is registered in the State of California and meets the Secretary of the Interior's Professional Qualification Standards for Historic Architecture.

The Secretary of the Interior's Standards for Treatment of Historic Properties, and the Secretary of the Interior's Professional Qualification Standards are available at the following website:

[http://www.nps.gov/history/local-law/arch\\_stnds\\_9.htm](http://www.nps.gov/history/local-law/arch_stnds_9.htm)

The Contractor must bear full liability for any damage to the historical buildings caused by the Contractor's operations.

In the event of failure to preserve the historical buildings, the Department may withhold an amount not less than \$2,000,000 from payments due or that may become due the Contractor under the contract, until an approved repair or reconstruction is complete.

### 5-1.25 NONHIGHWAY FACILITIES (INCLUDING UTILITIES)

During the progress of the work under this Contract, the utility owner will relocate a utility shown in the following table within the corresponding number of days shown. Notify the Engineer before you work within the approximate location of a utility shown. The days start on the notification date.

**Utility Relocation and Department-Arranged Time for the Relocation**

Utility	Location	Days
Fiber Optics (AT&T)	USCG Road (CG Line), during construction: Stage 4 Phase 2	30

The utilities shown in the following table may interfere with the bridge removal, and will remain in service until December 1, 2013.

Utility	Location
300 mm Water pipe (Navy)	Existing San Francisco-Oakland Bay Bridge (Br. No. 33-0025)
Fiber Optic (AT&T)	Existing San Francisco-Oakland Bay Bridge (Br. No. 33-0025)

#### 5-1.26 TUNNEL SAFETY ORDERS

The work to be performed at the following locations have been classified "Potentially Gassy with Special Conditions" by the State Division of Occupational Safety and Health under Section 8422 of the Tunnel Safety Orders of the California Code of Regulations.

1. Two 2.4 m diameter pile shafts at Bent 1 (Rt., Station E 50+47.4) and Bent 2 (Rt., Station E 50+74.62)
2. Three 1.524 m diameter CIDH piles at Bent 3 (Rt., Station E 51+09.75)
3. Thirty-six 0.915 m diameter drilled holes (Soldier Piles) for Retaining Wall No. 51

Information handouts of Underground Classifications by Division of Occupational Safety and Health Mining and Tunneling Unit are available in "Supplemental Project Information," of these special provisions.

The Contractor's attention is directed to Section 7-1.06, "Safety and Health Provisions," of the Standard Specifications. A change to the work as a direct result of the Contractor's planned operations that would cause work activities to fall under the requirements of the Tunnel Safety Orders, and that has not been shown on the plans or specified in these special provisions shall be reason for suspension of the work. The Contractor shall notify the Engineer not less than 20 days prior to worker exposure to a facility meeting the definition of a tunnel or shaft as described in Sections 8403 or 8405 of the Tunnel Safety Orders. The Department will obtain additional location classifications as may be necessary to allow the work to proceed.

The Contractor shall prominently post a notice of the classification and any special orders, rules, special conditions, or regulations at the tunnel work site, and all personnel shall be informed of the classification.

At least 7 days prior to beginning work covered by these provisions, the Contractor shall submit the name of the person designated as the on-site Safety Representative to the Engineer along with proof of certification by the Division of Occupational Safety and Health as having met the requirements of Section 8406 of the Tunnel Safety Orders of the California Code of Regulations.

#### 5-1.27 AREAS FOR CONTRACTOR'S USE

Attention is directed to the requirements specified in Section 7-1.19, "Rights in Land and Improvements," of the Standard Specifications, plans and these special provisions.

The Contractor shall coordinate with others in conforming to "Cooperation," of these special provisions.

Access to all areas shall be permitted by others as directed by the Engineer, and local streets Macalla Road and Northgate Road shall be open to traffic at all times.

The Contractor shall not occupy the right of way, or allow others to occupy the right of way, for purposes which are not necessary to perform the required work. The highway right of way shall be used only for purposes that are necessary to perform the required work. Area for others and for Contractor's use shall conform with the areas shown on the plans, and as specified in these special provisions.

#### Availability of Areas for Others' Use

Others	Areas for Others' Use	Date
04-0120S4	Area PR	Until January 1, 2014
04-0120F4	Area FP	Until August 31, 2014
04-0120F4	Area FT	Until August 31, 2014
04-3A6404	Area TA1	After June 1, 2014
	Area TA2	After June 1, 2014
	Area TA3	After June 1, 2014
	Area A	After January 1, 2014

Access to Area FT (Partial) between Labor Day weekend of year 2013 and August 31, 2014 shall be permitted to the Contractor to perform the SFOBB bridge removal as directed by the Engineer.  
Access to Area TA1 after June 1, 2014 shall be permitted to allow the Contractor to complete Stage 5 and Stage 6 work as directed by the Engineer.

#### **Availability of Areas for Contractor's Use**

Contract	Areas for Contractor's Use	Date
04-0120T4	Area TA1	From January 1, 2014 to June 1, 2014
	Area TA2	From January 1, 2014 to June 1, 2014
	Area TA3	From January 1, 2014 to June 1, 2014
	Area T (Partial - From Area PR)	After January 1, 2014
	Area T	After August 31, 2014
	Area CG	After January 1, 2014

**Area CG:** will not be available for the Contractor's storage of materials and equipment unless otherwise approved by both the USCG and the Engineer.

Attention is directed to "Supplemental Project Information," and "Permits, Licenses, Agreements, and Certifications," of these special provisions. Access to Area CG to perform work as shown on the plans shall be coordinated with both the USCG and the Engineer.

No area is available within the contract limits for the exclusive use of the Contractor. However, temporary storage of equipment and materials on State property may be arranged with the Engineer, subject to the prior demands of State maintenance forces and to other contract requirements. Use of the Contractor's work areas and other State-owned property shall be at the Contractor's own risk. The State shall not be held liable for damage to or loss of materials or equipment located within these areas.

Toll plaza parking lots shall not be used for the Contractor's employees private vehicles and the Contractor's equipment and vehicles.

The Contractor shall remove the equipment, materials, and rubbish from the work areas and other State-owned property which the Contractor occupies and shall leave the areas in a presentable condition, in conformance with the provisions in Section 4-1.02, "Final Cleaning Up," of the Standard Specifications.

The Contractor shall secure, at the Contractor's own expense, areas required for storage of plant, equipment, and materials, or for other purposes if sufficient area is not available to the Contractor within the contract limits.

#### **Port of Oakland Pier 7**

The Department intends to occupy and make available to contractors portions of Port of Oakland Pier 7 for the duration of the contract.

Attention is also directed to "Supplemental Project Information," for reference to plot map titled, "Pier 7 – Area for Contractor's Use," "Settlement Agreement regarding Burma Road Easement and Pier 7 Temporary Construction Easement," and the "Quitclaim Easement Deed."

Portions of Pier 7 are currently occupied by others. Referring to the areas identified on the information handout "Pier 7 – Areas for Contractor's Use," space on the pier is expected to be made available to the Contractor at no rental cost, on or before the following schedule:

Area 4: At 04-0120T4 contract award

Areas not available to the 04-0120T4 Contractor or designated as "Caltrans" shall not be used by the Contractor except for access via Burma Road and as otherwise permitted by the Engineer in writing.

By using the area provided at Pier 7, the Contractor agrees to the following terms of usage:

1. The Contractor may only use the designated areas for work exclusive to the 04-0120T4 contract for the following purposes only:
  - 1.1. Administration offices and parking for employees of the Contractor
  - 1.2. Storage of material

2. The Contractor shall agree to accept the property on an "as is" basis. The Contractor shall not call on the Department to make any improvements or repairs on the property, but the Contractor hereby specifically covenants and agrees to keep the property including furnishings and equipment, in good order and condition.
3. The Contractor shall comply with the terms of the contract as well as all State laws and local ordinances concerning said property and the use thereof.
4. The Department or its agents shall at all times have the right to enter the property for purposes of inspection of the property and to serve or to post thereon any notice required or permitted by law for protection of any right or interest of the Department.
5. The Contractor shall be responsible for coordinating with other contractors with regard to water access along the pier.
6. Prior to occupying an area of the pier, the Contractor shall conduct a survey of the property, including photos, describing the current condition of the property and submit the survey for the approval of the Engineer. Along with the survey, the Contractor shall submit for the information of the Engineer a site map identifying the planned uses of the property. Material storage sites shall be identified and shown on the site map and a listing of all materials used and stored on the property, or transported to and through the pier shall be included. Material Safety Data Sheets for the hazardous materials stored on the property shall be submitted to the Engineer.
7. The Contractor shall comply with the provisions in "Water Pollution Control," of these special provisions. The Contractor shall not commit, suffer, or permit the accumulation of waste on the property and shall provide an adequate number of garbage and trash receptacles in clean condition and good repair.
8. In no case shall the Contractor cause or allow the deposit or disposal of hazardous materials on the property. The Contractor shall be responsible for and bear the entire cost of removal and disposal of hazardous materials or waste introduced to the property during the Contractor's period of use and possession as owner, operator or occupier of the property. The Contractor shall also be responsible for any cleanup and decontamination on or off the property necessitated by such materials or waste.
9. There is limited additional utility capacity available at Pier 7, including but not limited to, power, telecommunications, and sewer capacity. The public water source on the pier is being used at its full capacity. The Contractor shall develop his own water source, and shall not use the public water source. The Contractor shall investigate the other utility capacity to support the needs of any use of the pier. The Contractor shall pay when due all water, electric, gas, and other lighting, heating, power, and charges accruing or payable in connection with said property, during the term of use.
10. At the expiration of the term, the Contractor shall quit and surrender possession of the property and its appurtenances to the Department in as good order and condition as the property was delivered to the Contractor, reasonable wear and tear and damage by the elements excepted.
11. The Contractor shall not encumber, assign, or sublet the pier 7 property in any manner whatsoever.
12. The Department will not keep the property insured against fire or any other insurable risk, and the Contractor will make no claim of any nature against the Department by reason of any damage to the Contractor's property in the event it is damaged or destroyed by fire or by any other cause.
13. Indemnification: The Contractor shall indemnify, defend and hold harmless the Department, its officers, agents and employees to the same extent as required by Section 7-1.12A of the Standard Specifications.
14. Liability and Property Damage Insurance: Insurance shall conform to the requirements of Section 7-1.12B of the Standard Specifications.
15. Hazardous substances may be present on the property in the areas shown as Environmentally Sensitive Areas (ESAs) as shown on the plot map titled "Pier 7 – Area for Contractor's Use" and in all drainage inlets. The Contractor shall have no permanent anchorage or occupation on or near these potentially hazardous materials locations and shall vacate said areas within 48 hours notice of the Engineer. The Contractor shall cooperate and coordinate with the Department, or its agents or contractors or third parties, including, but not limited to the City of Oakland, the United States Department of the Army and the California Department of Toxic Substances Control in the remediation of said potentially hazardous materials locations. It is expected that any necessary hazardous material remediation of hazardous materials locations by others may occur during the duration of contract 04-0120T4 and that the Contractor may be required to vacate minor portions of the pier around the potentially hazardous materials locations to facilitate access.

The Department reserves the right to terminate the Contractor's use of pier 7 or take other appropriate action at no cost to the Department, if the terms of the above usage agreement are not complied with. Provided that the terms of the above usage agreement are complied with, should the Department order the Contractor to vacate significant portions of Pier 7 early, the additional relocation costs as directed by the Engineer will be paid for as extra work as

provided in Section 4-1.03D, "Extra Work," of the Standard Specifications. The Contractor shall be responsible for all costs related to occupying and operating at Pier 7 including, but not limited to, compliance with the above usage agreement terms, utility connections, maintenance and operational cost of utilities, improvements needed for intended use including use of the crane, relocation of occupation or operations to facilitate hazardous material remediation, and cost related to vacate and restore property to original conditions at the termination of the occupancy agreement.

#### **5-1.28 UTILITIES**

The Contractor shall make arrangements to obtain electrical power, water or compressed air or other utilities required for the Contractor's operations and shall make and maintain the necessary service connections at the Contractor's own expense.

#### **5-1.29 SANITARY PROVISIONS**

State sanitary facilities will not be available for use by the Contractor's employees.

#### **5-1.30 BRIDGE TOLLS**

Toll-free passage on the San Francisco-Oakland Bay Bridge will be granted only for cars, trucks and special construction equipment which are clearly marked on the exterior with the Contractor's identification and which are being operated by the Contractor exclusively for the project, and which are used for the purpose of transporting materials and workers directly to and from the project site.

The Contractor shall make application to the Engineer in advance for toll-free passage. The Contractor will be held accountable for the proper use of passes issued, and upon completion of the work, shall return unused passes to the Engineer.

Attention is directed to Section 23302, "Evasion of Toll," of the Vehicle Code.

#### **5-1.31 ACCESS TO PROJECT SITE**

Prospective bidders may make arrangements to visit the project site by contacting the Duty Senior, District 04 Office, 111 Grand Avenue, Oakland, CA 94612, email: duty\_senior\_district04@dot.ca.gov, telephone number (510) 286-5209.

#### **5-1.32 PERMITS, LICENSES, AGREEMENTS, AND CERTIFICATIONS**

Attention is directed to Section 7-1.04, "Permits and Licenses," of the Standard Specifications and these special provisions.

The Contractor shall be fully aware of all rules, regulations, terms and conditions of the permits, licenses, agreements, and certifications that may govern the contractor's operations in the project area and shall conduct work accordingly. The permits, licenses, agreements, and certifications shall be considered a part of the special provisions and contract for this project. Any modification to the permits, licenses, agreements, and certifications which are proposed by the contractor shall be submitted in writing to the Engineer for transmittal to the regulatory agency for their consideration. No additional time or compensation will be allowed for delays by the Contractor's proposed modification to the agreements between the Department and regulatory agencies. The Department has obtained the permits and licenses from the following agencies for this project:

1. California Regional Water Quality Control Board (RWQCB)
2. San Francisco Bay Conservation Development Commission (BCDC)
3. U.S. Army Corps of Engineers (ACOE)
4. United States Coast Guard (USCG)
5. California Department of Fish and Game (CDFG)
6. United States Fish and Wildlife Service (USFWS)
7. National Marine Fisheries Service (NMFS)

Copies of these permits, and licenses have been made on Compact Disks as part of the information handout that is available to the Contractor, as specified in "Supplemental Project Information," of these special provisions that can be obtained at the Department of Transportation, Plans and Bid Documents Section, MS 26, 1120 N Street, Room 200, Sacramento, CA 95814, Telephone 916-654-4490 or may be seen and are available for inspection at the Duty Senior, District 04 Office, 111 Grand Avenue, Oakland, CA 94612, email: duty\_senior\_district04@dot.ca.gov, telephone number (510) 286-5209.



For the latest versions of environmental permits, the Bidders and Contractor shall visit the website:

[www.biomitigation.org](http://www.biomitigation.org)

Full compensation for conforming to the requirements in these permits, licenses, agreements and certifications shall be considered as included in the prices paid for the various contract items of work and no additional compensation will be allowed therefor.

### **5-1.33 PHOTO IDENTIFICATION SYSTEM**

Photo identification system shall consist of photo identification (ID) cards, production equipment and database. The Contractor shall submit a database record of every person contemplated to work on the project jobsite, including the employees of the subcontractors, vendor and suppliers.

All employees, including subcontractor, vendors and suppliers, shall have photo ID cards when reporting to work at the jobsite. Photo ID cards shall consist of a visible badge which shall be worn plainly visible at all times and a wallet-size card which shall be available for inspection as required. The front side of the badge shall contain a visible, identifiable photograph with a minimum size of 25 mm x 25 mm, the person's last name, first name, employee ID number, issue date, expiration date and employer logo. Wallet-size cards shall contain the last name, first name, middle initial, issue date, expiration date and issuer signature. Any lost badges or cards shall be immediately reported to the Engineer prior to being replaced. Individuals who do not possess the required photo ID cards shall be removed from the work site immediately at the Engineer's request.

Production equipment shall consist of system software, camera and duplex card printer. Equipment shall have the following standard features or equivalent, as determined by the Engineer:

1. **System Software.**--ID works production software will have the following standard features:
  - 1.1. Microsoft WindowsXP operation;
  - 1.2. Full user audit log;
  - 1.3. Administrator and user security;
  - 1.4. BMP, .JPG, .PCX, .PNG, and .PSD image import formats;
  - 1.5. BMP, .JPG, .PCX, .TGA, .TIF, .WMF image export formats;
  - 1.6. Full character recognition search (alphabets, numbers) in all fields;
  - 1.7. Automatic update of database after badge production;
  - 1.8. Simultaneous batch print of multiple card formats;
  - 1.9. Software license key;
  - 1.10. Online Help and reference library; and
  - 1.11. Documentation, installation, training and Help Desk support.
2. **Camera.**-- The camera used for producing employee ID badges shall be USB digital with the following specifications:
  - 2.1. Compatible with Windows 98, ME, 2000 Professional 2000 or XP;
  - 2.2. External AC power supply (auto-switch);
  - 2.3. Operating Environment for humidity from 30 percent to 90 percent and for temperature from 0°C to 40°C;
  - 2.4. Resolutions of 1600 x 1200, 1024 x 768, or 640 x 480 pixels;
  - 2.5. Lens of sizes from 7.1 mm to 21.3 mm, F/1.8 to F/2.6 (equivalent to 40 mm to 120 mm lens for 35 mm camera);
  - 2.6. Flash range appropriate for a subject 1.8 to 3 meters from camera;
  - 2.7. CE Mark, FCC Class B and UL approved.

In addition, the camera shall have the following features and components:

1. Datacard Integrated USB Digital Camera Software with controlled Auto-Crop or Manual ~p;
2. USB cable connection to PC;
3. High, Medium and Low resolution (customer selectable);
4. Built-in flash;
5. Automatic focus and exposure;
6. 3x Optical Zoom;

7. 5 Megapixel RGB CCD;
8. Country Specific Power Cords;
9. Power adapter (auto switches for the appropriate voltage);
10. Tripod, backdrop, frame and stand;
11. Installation instruction and manuals
12. 3 meter USB cable; and
13. Three 64 MB Compact Flash or SmartMedia memory cards, or equivalent.

3. **Duplex Card Printer.**--The duplex card printer shall have the following features and specifications:

- 3.1. Windows 2000 or XP drivers;
- 3.2. CD ROM tutorial;
- 3.3. Operator-replaceable printhead;
- 3.4. Audio and visual error prompts;
- 3.5. Operator messages displayed on PC screen;
- 3.6. Automatic card feed;
- 3.7. "True" exception card system;
- 3.8. Full-color or monochrome imaging;
- 3.9. One-step ribbon cartridge replacement;
- 3.10. Hands-free card cleaning system;
- 3.11. In-line topcoat application;
- 3.12. Portable, desktop design;
- 3.13. Input hopper holds each cards - 0.76 mm thick;
- 3.14. Output hopper holds each cards - 0.76 mm thick;
- 3.15. One-year depot warranty for printer;
- 3.16. One-year printhead warranty -no prorating, no card counting;
- 3.17. Continuous-tone, full-color, with alphanumeric text and logos print capability;
- 3.18. Background patterns with 300 dots per inch print resolution, In-line ribbon application of single topcoat capability , and dual voltage-auto sensing electrical requirements;
- 3.19. 110/120V , 50/60 Hz and 220/240 V, 50/60 Hz;
- 3.20. Parallel ECP mode or Compatible mode communications;
21. CR80-30 Plastic cards accepted,
- 3.21. PVC, with glossy overlamine laminate surface ID cards, 86 mm x 54 mm in size and 0.8 mm in thickness;
- 3.22. Resident memory of 2 MB; and
- 3.23. UL, CSA, FCC Class A (for U.S. and Canada) approved.

A database record shall be furnished to the Engineer at least three days prior to beginning of work. It will be updated for new employees, subcontractors or suppliers daily and submitted weekly to the Engineer. This database shall contain the following information:

1. Caltrans contract number;
2. Contractor/Subcontractor/Vendor/Supplier ID number;
3. Employee ID number;
4. Last name;
5. First name;
6. Middle name;
7. Labor classification;
8. Date of hire/employment date;
9. Length of employment;
10. Issue date; and
11. Expiration date.

All data shall be delivered to the Engineer electronically, on 700-megabyte Compact Disks compatible with the Microsoft Windows operating system. The Contractor shall provide an updated personnel information whenever there is a change or at least five working days after requested by the I Engineer. The file format for all files delivered to the Engineer shall be standard comma delimited c (CSV), plain text files. Characteristics of this type of file are:

1. All data is in the form of plain ASCII characters;
2. Each row of data is delimited by a carriage return character, and
3. Within row, each column (field) of data is delimited by a comma character.

Full compensation for providing photo identification system shall be included in the various items of work involved, and no separate payment will be made therefor.

#### **5-1.34 RESPONSIBILITY TO OTHERS**

The Contractor shall be responsible for any liability imposed by law and for injuries to or death of any person including, but not limited to, workers and the public or damage to property, and shall indemnify and save harmless T.Y. Lin International / Moffatt & Nichol Engineers, a Joint Venture and its consultants and subconsultants, in the same manner and to the same extent conforming to the provisions in Section 7-1.12, "Indemnification and Insurance," of the Standard Specifications for the protection of the State of California and all officers and employees thereof connected with the work. The Contractor's commercial general liability (CGL) insurance policies shall name T.Y. Lin International / Moffatt & Nichol Engineers, a Joint Venture, their respective affiliates, parent or affiliated corporations, directors, officers, partners, representatives, employees, consultants, subconsultants and agents, as additional Insureds in the same manner and to the same extent that the State of California is named as an additional insured conforming to the provisions of Section 7-1.12, "Indemnification and Insurance," of the Standard Specifications and these special provisions.

Certificate of Insurance shall provide ten (10) days advance written notice of cancellation or renewal. In addition to any other requirements to furnish copies of insurance documents in these specifications, the Contractor shall provide certificates of liability insurance and endorsements to the following address:

T.Y. Lin International / Moffatt & Nichol Engineers, A Joint Venture  
c/o Dealey, Renton & Associates  
P.O. Box 12675  
Oakland, CA 94604-2675  
Attn: Julie Nelson

#### **SECTION 6. (BLANK)**

#### **SECTION 7. (BLANK)**

#### **SECTION 8. MATERIALS**

##### **SECTION 8-1. MISCELLANEOUS**

##### **8-1.01 SUBSTITUTION OF NON-METRIC MATERIALS AND PRODUCTS**

Only materials and products conforming to the requirements of the specifications shall be incorporated in the work. When metric materials and products are not available, and when approved by the Engineer, and at no cost to the State, materials and products in the United States Standard Measures which are of equal quality and of the required properties and characteristics for the purpose intended, may be substituted for the equivalent metric materials and products, subject to the following provisions:

- A. Materials and products shown on the plans or in the special provisions as being equivalent may be substituted for the metric materials and products specified or detailed on the plans.
- B. Before other non-metric materials and products will be considered for use, the Contractor shall furnish, at the Contractor's expense, evidence satisfactory to the Engineer that the materials and products proposed for use are equal to or better than the materials and products specified or detailed on the plans. The burden of

proof as to the quality and suitability of substitutions shall be upon the Contractor and the Contractor shall furnish necessary information as required by the Engineer. The Engineer will be the sole judge as to the quality and suitability of the substituted materials and products and the Engineer's decision will be final.

- C. When the Contractor elects to substitute non-metric materials and products, including materials and products shown on the plans or in the special provisions as being equivalent, the list of sources of material specified in Section 6-1.01, "Source of Supply and Quality of Materials," of the Standard Specification shall include a list of substitutions to be made and contract items involved. In addition, for a change in design or details, the Contractor shall submit plans and working drawings in conformance with the provisions in Section 5-1.02, "Plans and Working Drawings," of the Standard Specifications. The plans and working drawings shall be submitted at least 7 days before the Contractor intends to begin the work involved.

Unless otherwise specified, the following substitutions of materials and products will be allowed:

**SUBSTITUTION TABLE FOR PLAIN WIRE REINFORCEMENT**

ASTM Designation: A 82

METRIC SIZE SHOWN ON THE PLANS <sup>2</sup> mm	SIZE TO BE SUBSTITUTED <sup>2</sup> inch x 100
MW9	W1.4
MW10	W1.6
MW13	W2.0
MW15	W2.3
MW19	W2.9
MW20	W3.1
MW22	W3.5
MW25	W3.9, except W3.5 in piles only
MW26	W4.0
MW30	W4.7
MW32	W5.0
MW35	W5.4
MW40	W6.2
MW45	W6.5
MW50	W7.8
MW55	W8.5, except W8.0 in piles only
MW60	W9.3
MW70	W10.9, except W11.0 in piles only
MW80	W12.4
MW90	W14.0
MW100	W15.5

**SUBSTITUTION TABLE FOR BAR REINFORCEMENT**

<b>METRIC BAR DESIGNATION NUMBER<sup>1</sup> SHOWN ON THE PLANS</b>	<b>BAR DESIGNATION NUMBER<sup>2</sup> TO BE SUBSTITUTED</b>
10	3
13	4
16	5
19	6
22	7
25	8
29	9
32	10
36	11
43	14
57	18

<sup>1</sup>Bar designation numbers approximate the number of millimeters of the nominal diameter of the bars.

<sup>2</sup>Bar numbers are based on the number of eighths of an inch included in the nominal diameter of the bars.

No adjustment will be required in spacing or total number of reinforcing bars due to a difference in minimum yield strength between metric and non-metric bars.

**SUBSTITUTION TABLE FOR SIZES OF:**

(1) STEEL FASTENERS FOR GENERAL APPLICATIONS (ASTM Designation: A 307 or AASHTO Designation: M 314, Grade 36 or 55), and

(2) HIGH STRENGTH STEEL FASTENERS (ASTM Designation: A 325 or A 449)

<b>METRIC SIZE SHOWN ON THE PLANS mm</b>	<b>SIZE TO BE SUBSTITUTED Inch</b>
6 or 6.35	1/4
8 or 7.94	5/16
10 or 9.52	3/8
11 or 11.11	7/16
13, 12.70, or M12	1/2
14 or 14.29	9/16
16, 15.88, or M16	5/8
19, 19.05, or M20	3/4
22, 22.22, or M22	7/8
24, 25, 25.40, or M24	1
29, 28.58, or M27	1-1/8
32, 31.75, or M30	1-1/4
35 or 34.93	1-3/8
38, 38.10, or M36	1-1/2
44 or 44.45	1-3/4
51 or 50.80	2
57 or 57.15	2-1/4
64 or 63.50	2-1/2
70 or 69.85	2-3/4
76 or 76.20	3
83 or 82.55	3-1/4
89 or 88.90	3-1/2
95 or 95.25	3-3/4
102 or 101.60	4

**SUBSTITUTION TABLE FOR NOMINAL THICKNESS OF SHEET METAL**

<b>UNCOATED HOT AND COLD ROLLED SHEETS</b>		<b>HOT-DIPPED ZINC COATED SHEETS (GALVANIZED)</b>	
<b>METRIC THICKNESS SHOWN ON THE PLANS mm</b>	<b>GAGE TO BE SUBSTITUTED inch</b>	<b>METRIC THICKNESS SHOWN ON THE PLANS mm</b>	<b>GAGE TO BE SUBSTITUTED Inch</b>
7.94	0.3125	4.270	0.1681
6.07	0.2391	3.891	0.1532
5.69	0.2242	3.510	0.1382
5.31	0.2092	3.132	0.1233
4.94	0.1943	2.753	0.1084
4.55	0.1793	2.372	0.0934
4.18	0.1644	1.994	0.0785
3.80	0.1495	1.803	0.0710
3.42	0.1345	1.613	0.0635
3.04	0.1196	1.461	0.0575
2.66	0.1046	1.311	0.0516
2.28	0.0897	1.158	0.0456
1.90	0.0747	1.006 or 1.016	0.0396
1.71	0.0673	0.930	0.0366
1.52	0.0598	0.853	0.0336
1.37	0.0538	0.777	0.0306
1.21	0.0478	0.701	0.0276
1.06	0.0418	0.627	0.0247
0.91	0.0359	0.551	0.0217
0.84	0.0329	0.513	0.0202
0.76	0.0299	0.475	0.0187
0.68	0.0269	-----	-----
0.61	0.0239	-----	-----
0.53	0.0209	-----	-----
0.45	0.0179	-----	-----
0.42	0.0164	-----	-----
0.38	0.0149	-----	-----

**SUBSTITUTION TABLE FOR WIRE**

<b>METRIC THICKNESS SHOWN ON THE PLANS mm</b>	<b>WIRE THICKNESS TO BE SUBSTITUTED inch</b>	<b>GAGE NO.</b>
6.20	0.244	3
5.72	0.225	4
5.26	0.207	5
4.88	0.192	6
4.50	0.177	7
4.11	0.162	8
3.76	0.148	9
3.43	0.135	10
3.05	0.120	11
2.69	0.106	12
2.34	0.092	13
2.03	0.080	14
1.83	0.072	15
1.57	0.062	16
1.37	0.054	17
1.22	0.048	18
1.04	0.041	19
0.89	0.035	20

**SUBSTITUTION TABLE FOR PIPE PILES**

<b>METRIC SIZE SHOWN ON THE PLANS mm x mm</b>	<b>SIZE TO BE SUBSTITUTED inch x inch</b>
PP 360 x 4.55	NPS 14 x 0.179
PP 360 x 6.35	NPS 14 x 0.250
PP 360 x 9.53	NPS 14 x 0.375
PP 360 x 11.12	NPS 14 x 0.438
PP 406 x 12.70	NPS 16 x 0.500
PP 460 x T	NPS 18 x T"
PP 508 x T	NPS 20 x T"
PP 559 x T	NPS 22 x T"
PP 610 x T	NPS 24 x T"
PP 660 x T	NPS 26 x T"
PP 711 x T	NPS 28 x T"
PP 762 x T	NPS 30 x T"
PP 813 x T	NPS 32 x T"
PP 864 x T	NPS 34 x T"
PP 914 x T	NPS 36 x T"
PP 965 x T	NPS 38 x T"
PP 1016 x T	NPS 40 x T"
PP 1067 x T	NPS 42 x T"
PP 1118 x T	NPS 44 x T"
PP 1219 x T	NPS 48 x T"
PP 1524 x T	NPS 60 x T"

The thickness in millimeters (T) represents an exact conversion of the thickness in inches (T").

**SUBSTITUTION TABLE FOR CIDH CONCRETE PILING**

<b>METRIC SIZE SHOWN ON THE PLANS</b>	<b>ACTUAL AUGER SIZE TO BE SUBSTITUTED inches</b>
350 mm	14
400 mm	16
450 mm	18
600 mm	24
750 mm	30
900 mm	36
1.0 m	42
1.2 m	48
1.5 m	60
1.8 m	72
2.1 m	84
2.4 m	96
2.7 m	108
3.0 m	120
3.3 m	132
3.6 m	144
4.0 m	156

**SUBSTITUTION TABLE FOR STRUCTURAL TIMBER AND LUMBER**

<b>METRIC MINIMUM DRESSED DRY, SHOWN ON THE PLANS mm x mm</b>	<b>METRIC MINIMUM DRESSED GREEN, SHOWN ON THE PLANS mm x mm</b>	<b>NOMINAL SIZE TO BE SUBSTITUTED inch x inch</b>
19x89	20x90	1x4
38x89	40x90	2x4
64x89	65x90	3x4
89x89	90x90	4x4
140x140	143x143	6x6
140x184	143x190	6x8
184x184	190x190	8x8
235x235	241x241	10x10
286x286	292x292	12x12



**SUBSTITUTION TABLE FOR NAILS AND SPIKES**

<b>METRIC COMMON NAIL, SHOWN ON THE PLANS</b>	<b>METRIC BOX NAIL, SHOWN ON THE PLANS</b>	<b>METRIC SPIKE, SHOWN ON THE PLANS</b>	<b>SIZE TO BE SUBSTITUTED Penny-weight</b>
Length, mm Diameter, mm	Length, mm Diameter, mm	Length, mm Diameter, mm	
50.80 2.87	50.80 2.51	—————	6d
63.50 3.33	63.50 2.87	—————	8d
76.20 3.76	76.20 3.25	76.20 4.88	10d
82.55 3.76	82.55 3.25	82.55 4.88	12d
88.90 4.11	88.90 3.43	88.90 5.26	16d
101.60 4.88	101.60 3.76	101.60 5.72	20d
114.30 5.26	114.30 3.76	114.30 6.20	30d
127.00 5.72	127.00 4.11	127.00 6.68	40d
—————	—————	139.70 7.19	50d
—————	—————	152.40 7.19	60d

**SUBSTITUTION TABLE FOR IRRIGATION  
COMPONENTS**

METRIC WATER METERS, TRUCK LOADING STANDPIPES, VALVES, BACKFLOW PREVENTERS, FLOW SENSORS, WYE STRAINERS, FILTER ASSEMBLY UNITS, PIPE SUPPLY LINES, AND PIPE IRRIGATION SUPPLY LINES SHOWN ON THE PLANS DIAMETER NOMINAL (DN)	NOMINAL SIZE TO BE SUBSTITUTED
mm	inch
15	1/2
20	3/4
25	1
32	1-1/4
40	1-1/2
50	2
65	2-1/2
75	3
100	4
150	6
200	8
250	10
300	12
350	14
400	16

Unless otherwise specified, substitutions of United States Standard Measures standard structural shapes corresponding to the metric designations shown on the plans and in conformance with the requirements in ASTM Designation: A 6/A 6M, Annex 2, will be allowed.

**8-1.02 PREQUALIFIED AND TESTED SIGNING AND DELINEATION MATERIALS**

The Department maintains the following list of Prequalified and Tested Signing and Delineation Materials. The Engineer shall not be precluded from sampling and testing products on the list of Prequalified and Tested Signing and Delineation Materials.

The manufacturer of products on the list of Prequalified and Tested Signing and Delineation Materials shall furnish the Engineer a Certificate of Compliance in conformance with the provisions in Section 6-1.07, "Certificates of Compliance," of the Standard Specifications for each type of traffic product supplied.

For those categories of materials included on the list of Prequalified and Tested Signing and Delineation Materials, only those products shown within the listing may be used in the work. Other categories of products, not included on the list of Prequalified and Tested Signing and Delineation Materials, may be used in the work provided they conform to the requirements of the Standard Specifications.

Materials and products may be added to the list of Prequalified and Tested Signing and Delineation Materials if the manufacturer submits a New Product Information Form to the New Product Coordinator at the Transportation Laboratory. Upon a Departmental request for samples, sufficient samples shall be submitted to permit performance of required tests. Approval of materials or products will depend upon compliance with the specifications and tests the Department may elect to perform.

## **PAVEMENT MARKERS, PERMANENT TYPE**

### **Retroreflective With Abrasion Resistant Surface (ARS)**

1. Apex, Model 921AR (100 mm x 100 mm)
2. Ennis Paint, Models C88 (100 mm x 100 mm), 911 (100 mm x 100 mm) and C80FH
3. Ray-O-Lite, Model "AA" ARS (100 mm x 100 mm) and ARC Round Shoulder (100 mm x 100 mm)
4. 3M Series 290 (89 mm x 100 mm)
5. 3M Series 290 PSA
6. Glowlite, Inc Model 988AR (100 mm x 100 mm)

### **Retroreflective With Abrasion Resistant Surface (ARS)**

(for recessed applications only)

1. Ennis Paint, Model 948 (58 mm x 119 mm)
2. Ennis Paint, Model 944SB (51 mm x 100 mm)\*
3. Ray-O-Lite, Model 2002 (51 mm x 117 mm)
4. Ray-O-Lite, Model 2004 ARS (51 mm x 100 mm)\*

\*For use only in 114 mm wide (older) recessed slots

### **Non-Reflective, 100-mm Round**

1. Apex Universal (Ceramic)
2. Apex Universal, Models 929 (ABS) and 929PP (Polypropylene)
3. Glowlite, Inc. (Ceramic) and PP (Polypropylene)
4. Hi-Way Safety, Inc., Models P20-2000W and 2001Y (ABS)
5. Interstate Sales, "Diamond Back" (Polypropylene)
6. Novabrite Models Cdot (White) Cdot-y (Yellow), Ceramic
7. Novabrite Models Pdot-w (White) Pdot-y (Yellow), Polypropylene
8. Three D Traffic Works TD10000 (ABS), TD10500 (Polypropylene)

## **PAVEMENT MARKERS, TEMPORARY TYPE**

### **Temporary Markers For Long Term Day/Night Use (180 days or less)**

1. Vega Molded Products "Temporary Road Marker" (75 mm x 100 mm)

### **Temporary Markers For Short Term Day/Night Use (14 days or less)**

(For seal coat or chip seal applications, clear protective covers are required)

1. Apex Universal, Model 932
2. Filtrona Extrusion, Models T.O.M., T.R.P.M., and "HH" (High Heat)
3. Hi-Way Safety, Inc., Model 1280/1281
4. Glowlite, Inc., Model 932

## **STRIPING AND PAVEMENT MARKING MATERIAL**

### **Permanent Traffic Striping and Pavement Marking Tape**

1. Advanced Traffic Marking, Series 300 and 400
2. Brite-Line, Series 1000
3. Brite-Line, "DeltaLine XRP"
4. Swarco Industries, "Director 35" (For transverse application only)
5. Swarco Industries, "Director 60"
6. 3M, "Stamark" Series 380 and 5730
7. 3M, "Stamark" Series 420 (For transverse application only)

### **Temporary (Removable) Striping and Pavement Marking Tape (180 days or less)**

1. Advanced Traffic Marking, Series 200
2. Brite-Line, Series 100
3. Garlock Rubber Technologies, Series 2000
4. P.B. Laminations, Aztec, Grade 102
5. Swarco Industries, "Director-2"
6. Trelleborg Industries, R140 Series
7. 3M Series 620 "CR", and Series A750

8. 3M Series A145, Removable Black Line Mask  
(Black Tape: for use only on Hot mix asphalt surfaces)
9. Advanced Traffic Marking Black "Hide-A-Line"  
(Black Tape: for use only on Hot mix asphalt surfaces)
10. Brite-Line "BTR" Black Removable Tape  
(Black Tape: for use only on Hot mix asphalt surfaces)
11. Trelleborg Industries, RB-140  
(Black Tape: for use only on Hot mix asphalt surfaces)

**Preformed Thermoplastic (Heated in place)**

1. Flint Trading Inc., "Hot Tape"
2. Flint Trading Inc., "Premark Plus"
3. Ennis Paint Inc., "Flametape"

**Ceramic Surfacing Laminate, 150 mm x 150 mm**

1. Highway Ceramics, Inc.

**CLASS 1 DELINEATORS**

**One Piece Driveable Flexible Type, 1700-mm**

1. Filtrona Extrusion, "Flexi-Guide Models 400 and 566"
2. Carsonite, Curve-Flex CFRM-400
3. Carsonite, Roadmarker CRM-375
4. FlexStake, Model 654 TM
5. GreenLine Model CGD1-66

**Special Use Type, 1700-mm**

1. Filtrona Extrusion, Model FG 560 (with 450-mm U-Channel base)
2. Carsonite, "Survivor" (with 450-mm U-Channel base)
3. Carsonite, Roadmarker CRM-375 (with 450-mm U-Channel base)
4. FlexStake, Model 604
5. GreenLine Model CGD (with 450-mm U-Channel base)
6. Impact Recovery Model D36, with #105 Driveable Base
7. Safe-Hit with 200-mm pavement anchor (SH248-GP1)
8. Safe-Hit with 380-mm soil anchor (SH248-GP2) and with 450-mm soil anchor (SH248-GP3)

**Surface Mount Type, 1200-mm**

1. Bent Manufacturing Company, Masterflex Model MF-180EX-48
2. Carsonite, "Channelizer"
3. FlexStake, Models 704, 754 TM, and EB4
4. Impact Recovery Model D48, with #101 Fixed (Surface-Mount) Base
5. Three D Traffic Works "Channelflex" ID No. 522248W

**CHANNELIZERS**

**Surface Mount Type, 900-mm**

1. Bent Manufacturing Company, Masterflex Models MF-360-36 (Round) and MF-180-36 (Flat)
2. Filtrona Extrusion, Flexi-Guide Models FG300PE, FG300UR, and FG300EFX
3. Carsonite, "Super Duck" (Round SDR-336)
4. Carsonite, Model SDCF03601MB "Channelizer"
5. FlexStake, Models 703, 753 TM, and EB3
6. GreenLine, Model SMD-36
7. Hi-way Safety, Inc. "Channel Guide Channelizer" Model CGC36
8. Impact Recovery Model D36, with #101 Fixed (Surface-Mount) Base
9. Safe-Hit, Guide Post, Model SH236SMA and Dura-Post, Model SHL36SMA
10. Three D Traffic Works "Boomerang" 5200 Series

### **Lane Separation System**

1. Filtrona Extrusion, "Flexi-Guide (FG) 300 Curb System"
2. Qwick Kurb, "Klemmfix Guide System"
3. Dura-Curb System
4. Tuff Curb

### **CONICAL DELINEATORS, 1070-mm**

(For 700-mm Traffic Cones, see Standard Specifications)

1. Bent Manufacturing Company "T-Top"
2. Plastic Safety Systems "Navigator-1070 mm"
3. Traffix Devices "Grabber"
4. Three D Traffic Works "Ringtop" TD7000, ID No. 742143
5. Three D Traffic Works, TD7500
6. Work Area Protection Corp. C-42

### **OBJECT MARKERS**

#### **Type "K", 450-mm**

1. Filtrona Extrusion, Model FG318PE
2. Carsonite, Model SMD 615
3. FlexStake, Model 701 KM
4. Safe-Hit, Model SH718SMA

#### **Type "K-4" / "Q" Object Markers, 600-mm**

1. Bent Manufacturing "Masterflex" Model MF-360-24
2. Filtrona Extrusion, Model FG324PE
3. Carsonite, "Channelizer"
4. FlexStake, Model 701KM
5. Safe-Hit, Models SH824SMA\_WA and SH824GP3\_WA
6. Three D Traffic Works ID No. 531702W and TD 5200
7. Three D Traffic Works ID No. 520896W

### **CONCRETE BARRIER MARKERS AND TEMPORARY RAILING (TYPE K) REFLECTORS**

#### **Impactable Type**

1. ARTUK, "FB"
2. Filtrona Extrusion, Models PCBM-12 and PCBM-T12
3. Duraflex Corp., "Flexx 2020" and "Electriflexx"
4. Hi-Way Safety, Inc., Model GMKRM100
5. Plastic Safety Systems "BAM" Models OM-BARR and OM-BWAR
6. Three D Traffic Works "Roadguide" Model TD 9304

#### **Non-Impactable Type**

1. ARTUK, JD Series
2. Plastic Safety Systems "BAM" Models OM-BITARW and OM-BITARA
3. Vega Molded Products, Models GBM and JD
4. Plastic Vacuum Forming, "Cap-It C400"

### **METAL BEAM GUARD RAIL POST MARKERS**

(For use to the left of traffic)

1. Filtrona Extrusion, "Mini" (75 mm x 254 mm)
2. Creative Building Products, "Dura-Bull, Model 11201"
3. Duraflex Corp., "Railrider"
4. Plastic Vacuum Forming, "Cap-It C300"

## **CONCRETE BARRIER DELINEATORS, 400-mm**

(For use to the right of traffic)

1. Filtrona Extrusion, Model PCBM T-16
2. Safe-Hit, Model SH216RBM

## **CONCRETE BARRIER-MOUNTED MINI-DRUM (260 mm x 360 mm x 570 mm)**

1. Stinson Equipment Company "SaddleMarker"

## **GUARD RAILING DELINEATOR**

(Place top of reflective element at 1200 mm above plane of roadway)

### **Wood Post Type, 686-mm**

1. Filtrona Extrusion, FG 427 and FG 527
2. Carsonite, Model 427
3. FlexStake, Model 102 GR
4. GreenLine GRD 27
5. Safe-Hit, Model SH227GRD
6. Three D Traffic Works "Guardflex" TD9100
7. New Directions Mfg, NDM27

### **Steel Post Type**

1. Carsonite, Model CFGR-327

## **RETROREFLECTIVE SHEETING**

### **Channelizers, Barrier Markers, and Delineators**

1. Avery Dennison T-6500 Series (For rigid substrate devices only)
2. Avery Dennison WR-7100 Series
3. Nippon Carbide Industries, Flexible Ultralite Grade (ULG) II
4. Reflexite, PC-1000 Metalized Polycarbonate
5. Reflexite, AC-1000 Acrylic
6. Reflexite, AP-1000 Metalized Polyester
7. Reflexite, Conformalight, AR-1000 Abrasion Resistant Coating
8. 3M, High Intensity

### **Traffic Cones, 100-mm and 150-mm Sleeves**

1. Nippon Carbide Industries, Flexible Ultralite Grade (ULG) II
2. Reflexite, Vinyl, "TR" (Semi-transparent) or "Conformalight"
3. 3M Series 3840
4. Avery Dennison S-9000C

### **Drums**

1. Avery Dennison WR-6100
2. Nippon Carbide Industries, Flexible Ultralite Grade (ULG) II
3. Reflexite, "Conformalight", "Super High Intensity" or "High Impact Drum Sheeting"
4. 3M Series 3810

### **Barricades: Type I, Medium-Intensity (Typically Enclosed Lens, Glass-Bead Element)**

1. Nippon Carbide Industries, CN8117
2. Avery Dennison, W 1100 series
3. 3M Series CW 44

### **Barricades: Type II, Medium-High-Intensity (Typically Enclosed Lens, Glass-Bead Element)**

1. Avery Dennison, W-2100 Series

### **Signs: Type II, Medium-High-Intensity (Typically Enclosed Lens, Glass-Bead Element)**

1. Avery Dennison, T-2500 Series
2. Nippon Carbide Industries, Nikkalite 18000

**Signs: Type III, High-Intensity (Typically Encapsulated Glass-Bead Element)**

1. Avery Dennison, T-5500A and T-6500 Series
2. Nippon Carbide Industries, Nikkalite Brand Ultralite Grade II
3. 3M 3870 and 3930 Series

**Signs: Type IV, High-Intensity (Typically Unmetallized Microprismatic Element)**

1. Avery Dennison, T-6500 Series
2. Nippon Carbide Industries, Crystal Grade, 94000 Series
3. Nippon Carbide Industries, Model No. 94847 Fluorescent Orange
4. 3M Series 3930 and Series 3924S

**Signs: Type VI, Elastomeric (Roll-Up) High-Intensity, without Adhesive**

1. Avery Dennison, WU-6014
2. Novabrite LLC, "Econobrite"
3. Reflexite "Vinyl"
4. Reflexite "SuperBright"
5. Reflexite "Marathon"
6. 3M Series RS20

**Signs: Type VII, Super-High-Intensity (Typically Unmetallized Microprismatic Element)**

1. 3M Series 3924S, Fluorescent Orange
2. 3M LDP Series 3970

**Signs: Type VIII, Super-High-Intensity (Typically Unmetallized Microprismatic Element)**

1. Avery Dennison, T-7500 Series
2. Avery Dennison, T-7511 Fluorescent Yellow
3. Avery Dennison, T-7513 Fluorescent Yellow Green
4. Avery Dennison, W-7514 Fluorescent Orange
5. Nippon Carbide Industries, Nikkalite Crystal Grade Series 92800
6. Nippon Carbide Industries, Nikkalite Crystal Grade Model 92847 Fluorescent Orange

**Signs: Type IX, Very-High-Intensity (Typically Unmetallized Microprismatic Element)**

1. 3M VIP Series 3981 Diamond Grade Fluorescent Yellow
2. 3M VIP Series 3983 Diamond Grade Fluorescent Yellow/Green
3. 3M VIP Series 3990 Diamond Grade
4. Avery Dennison T-9500 Series
5. Avery Dennison, T9513, Fluorescent Yellow Green
6. Avery Dennison, W9514, Fluorescent Orange
7. Avery Dennison, T-9511 Fluorescent Yellow

**SPECIALTY SIGNS**

1. Reflexite "Endurance" Work Zone Sign (with Semi-Rigid Plastic Substrate)

**ALTERNATIVE SIGN SUBSTRATES**

**Fiberglass Reinforced Plastic (FRP) and Expanded Foam PVC**

1. Fiber-Brite (FRP)
2. Sequentia, "Polyplate" (FRP)
3. Inteplast Group "InteCel" (13 mm for Post-Mounted CZ Signs, 1200 mm or less)(PVC)

**Aluminum Composite, Temporary Construction Signs and Permanent Signs up to 1400 mm.**

1. Alcan Composites "Dibond Material, 2 mm"
2. Mitsubishi Chemical America, Alpollic 350

### **8-1.03 STATE-FURNISHED MATERIALS**

Attention is directed to Section 6-1.02, "State-Furnished Materials," of the Standard Specifications and these special provisions.

The following materials will be furnished to the Contractor:

1. Modular joints seal assemblies for Hinges W8B and W6RB.
2. Bike path at Pier W2.
3. Padlocks for backflow preventer assembly enclosures, walk gates, irrigation controller enclosure cabinets, and external cabinet for battery backup system.
4. Seven meter light poles and fixtures, including base plates, light fixtures with vibration inhibiting plates.
5. Three-and-a-half meter bike path Belvedere light poles and fixtures, including base plates, light fixtures with vibration inhibiting plates.
6. Bike path landing lighting and fixtures, including base plates, and light fixtures.
7. Model 170 controller assembly, and completely wired controller cabinet.
8. Call boxes.
9. Fire hydrant.

Completely wired controller cabinets, with auxiliary equipment but without controller unit, will be furnished to the Contractor at Electrical Maintenance Station, 30 Rickard Street, San Francisco, CA 94134, telephone number (415) 330-6509.

Seven meter light poles and fixtures, 3.5 meter bike path Belvedere light poles and fixtures, and bike path landing lighting and fixtures will be furnished to the Contractor at a location within 16 km of the project limits.

The Contractor shall notify the Engineer not less than 48 hours before State-furnished material is to be picked up by the Contractor. A full description of the material and the time the material will be picked up shall be provided.

### **8-1.04 ENGINEERING FABRICS**

Engineering fabrics shall conform to the provisions in Section 88, "Engineering Fabrics," of the Standard Specifications and these special provisions.

Filter fabric for this project shall be ultraviolet (UV) ray protected.

## **SECTION 8-2. CONCRETE**

### **8-2.01 PORTLAND CEMENT CONCRETE**

Portland cement concrete shall conform to the provisions in Section 90, "Portland Cement Concrete," of the Standard Specifications and these special provisions.

The Department maintains a list of sources of fine and coarse aggregate that have been approved for use with a reduced amount of supplementary cementitious material in the total amount of cementitious material to be used. A source of aggregate will be considered for addition to the approved list if the producer of the aggregate submits to the Transportation Laboratory certified test results from a qualified testing laboratory that verify the aggregate complies with the requirements. Before the testing starts, the aggregate test shall be registered with the Department. A registration number can be obtained by calling (916) 227-7228. The registration number shall be used as the identification for the aggregate sample in correspondence with the Department. Upon request, a split of the tested sample shall be provided to the Department. Approval of aggregate will depend upon compliance with the specifications, based on the certified test results submitted, together with any replicate testing the Department may elect to perform. Approval will expire 3 years from the date the most recent registered and evaluated sample was collected from the aggregate source.

Qualified testing laboratories shall conform to the following requirements:

1. Laboratories performing ASTM Designation: C 1293 shall participate in the Cement and Concrete Reference Laboratory (CCRL) Concrete Proficiency Sample Program and shall have received a score of 3 or better on each test of the previous 2 sets of concrete samples.
2. Laboratories performing ASTM Designation: C 1260 shall participate in the Cement and Concrete Reference Laboratory (CCRL) Pozzolan Proficiency Sample Program and shall have received a score of 3 or better on the shrinkage and soundness tests of the previous 2 sets of pozzolan samples.



Aggregates on the list shall conform to one of the following requirements:

1. When the aggregate is tested in conformance with the requirements in California Test 554 and ASTM Designation: C 1293, the average expansion at one year shall be less than or equal to 0.040 percent; or
2. When the aggregate is tested in conformance with the requirements in California Test 554 and ASTM Designation: C 1260, the average of the expansion at 16 days shall be less than or equal to 0.15 percent.

If the aggregates used in the concrete are on the Department's list, the minimum amount of supplementary cementitious material shall conform to the following:

1. If fly ash or natural pozzolan conforming to the provisions in Section 90-2.01C, "Required Use of Supplementary Cementitious Materials," of the Standard Specifications is used, the minimum amount of supplementary cementitious material shall be 15 percent by mass of the total cementitious material; or
2. If silica fume conforming to the provisions in Section 90-2.01C, "Required Use of Supplementary Cementitious Materials," of the Standard Specifications is used, the minimum amount of supplementary cementitious material shall be 7 percent by mass of the total cementitious material.

The limitation on tricalcium silicate ( $C_3S$ ) content in Type II cement specified in Section 90-2.01A, "Cement," of the Standard Specifications shall not apply.

### **8-2.02 CORROSION CONTROL FOR PORTLAND CEMENT CONCRETE**

Permanent structures with portland cement concrete in contact with soil or rock, including piles, footings, abutments, columns and retaining walls are considered to be in a corrosive environment and shall conform to the provisions in Section 90, "Portland Cement Concrete," of the Standard Specifications and these special provisions.

Cementitious material to be used in portland cement concrete shall conform to the provisions in Section 90-2, "Materials," of the Standard Specifications, and shall be a combination of either Type II or Type V portland cement and supplementary cementitious material.

Concrete in a corrosive environment shall contain not less than 400 kg of cementitious material per cubic meter.

Reduction in the cementitious material content specified or ordered in conformance with the provisions in Section 90-4.05, "Optional Use of Chemical Admixtures," of the Standard Specifications, is not permitted for concrete in a corrosive environment.

For concrete in a corrosive environment, the cementitious material shall be comprised of one of the following:

- A. 25 percent by mass of either fly ash or natural pozzolan with a CaO content of up to 10 percent, and 75 percent by mass of portland cement.
- B. 20 percent by mass of either fly ash or natural pozzolan with a CaO content of up to 10 percent, 5 percent by mass of silica fume, and 75 percent by mass of portland cement.
- C. 12 percent by mass of either silica fume, metakaolin, or UFFA; and 88 percent by mass of portland cement.
- D. 50 percent by mass of ground granulated blast furnace slag, and 50 percent by mass of portland cement.
- E. Any combination of the above supplementary cementitious materials adding up to at least 40% by mass of the total amount of cementitious material to be used in the concrete mix.

The ratio of the amount of free water to the amount of cementitious material used in concrete in a corrosive environment shall not exceed 0.40.

Full compensation for conforming to the above requirements shall be considered as included in the contract prices paid for the various contract items of work, and no additional compensation will be allowed therefor.

### **8-2.03 PRECAST CONCRETE QUALITY CONTROL**

#### **GENERAL**

Precast concrete quality control shall conform to these special provisions.

Unless otherwise specified, precast concrete quality control shall apply when any precast concrete members are fabricated in conformance with the provisions in Section 49, "Piling," or Section 51, "Concrete Structures," of the Standard Specifications.

Precast concrete quality control shall not apply to precast concrete members that are fabricated from minor concrete.

In addition, precast concrete quality control shall apply when precast members are fabricated for the following work:

A. Precast concrete slab (bike path)

Quality Control (QC) shall be the responsibility of the Contractor. The Contractor's QC inspectors shall perform inspection and testing prior to precasting, during precasting, and after precasting, and as specified in this section and additionally as necessary to ensure that materials and workmanship conform to the details shown on the plans, and to the specifications.

Quality Assurance (QA) is the prerogative of the Engineer. Regardless of the acceptance for a given precast element by the Contractor, the Engineer will evaluate the precast element. The Engineer will reject any precast element that does not conform to the approved Precast Concrete Quality Control Plan (PCQCP), the details shown on the plans, or to these special provisions.

The Contractor shall designate in writing a precast Quality Control Manager (QCM) for each precasting facility. The QCM shall be responsible directly to the Contractor for the quality of precasting, including materials and workmanship, performed by the Contractor and all subcontractors. The QCM shall be the sole individual responsible to the Contractor for submitting, receiving, and approving all correspondence, required submittals, and reports to and from the Engineer. The QCM shall not be employed or compensated by any subcontractor, or other persons or entities hired by subcontractors, or suppliers, who will provide other services or materials for the project. The QCM may be an employee of the Contractor.

Prior to submitting the PCQCP required herein, a meeting between the Engineer, the Contractor's QCM, and a representative from each entity performing precast concrete operations for this project, shall be held to discuss the requirements for precast quality control.

QC Inspectors shall either be 1) licensed as Civil Engineers in the State of California, or 2) have a current Plant Quality Personnel Certification, Level II, from the Precast/Prestressed Concrete Institute. A QC Inspector shall witness all precast concrete operations.

#### **PRECAST CONCRETE QUALIFICATION AUDIT**

Unless otherwise specified, no Contractors or subcontractors performing precast concrete operations for the project shall commence work without having successfully completed the Department's Precast Fabrication Qualification Audit, hereinafter referred to as the audit. Copies of the audit form, along with procedures for requesting and completing the audit, are available at:

<http://www.dot.ca.gov/hq/esc/Translab/OSM/smbresources.htm>

An audit that was previously approved by the Department no more than 3 years before the award of this contract will be acceptable for the entire period of this contract, provided the Engineer determines the audit is for the same type of work that is to be performed on this contract.

A list of facilities who have successfully completed the audit and are authorized to provide material for this contract is available at:

[http://www.dot.ca.gov/hq/esc/Translab/OSM/smdocuments/Internet\\_auditlisting.pdf](http://www.dot.ca.gov/hq/esc/Translab/OSM/smdocuments/Internet_auditlisting.pdf)

Successful completion of an audit shall not relieve the Contractor of the responsibility for furnishing materials or producing finished work of the quality specified in these special provisions and as shown on the plans.

#### **PRECAST CONCRETE QUALITY CONTROL PLAN**

Prior to performing any precasting operations, the Contractor shall submit to the Engineer, in conformance with the provisions in "Working Drawings" of these special provisions, 3 copies of a separate PCQCP for each item of work to be precast. A separate PCQCP shall be submitted for each facility. As a minimum, each PCQCP shall include the following:

- A. The name of the precasting firm, the concrete plants to be used, and any concrete testing firm to be used;
- B. A manual prepared by the precasting firm that includes equipment, testing procedures, safety plan, and the names, qualifications, and documentation of certifications for all personnel to be used;
- C. The name of the QCM and the names, qualifications, and documentation of certifications for all QC inspection personnel to be used;
- D. An organizational chart showing all QC personnel and their assigned QC responsibilities;

- E. The methods and frequencies for performing all required quality control procedures, including all inspections, material testing, and any required survey procedures for all components of the precast elements including prestressing systems, concrete, grout, reinforcement, steel components embedded or attached to the precast member, miscellaneous metal, and formwork;
- F. A system for identification and tracking of required precast element repairs, and a procedure for the reinspection of any repaired precast element. The system shall have provisions for a method of reporting nonconforming precast elements to the Engineer; and
- G. Forms to be used for Certificates of Compliance, daily production logs, and daily reports.

The Engineer shall have 4 weeks to review the PCQCP submittal after a complete plan has been received. No precasting shall be performed until the PCQCP is approved in writing by the Engineer.

A PCQCP that was previously approved by the Engineer no more than one year prior to the beginning of work on this contract will be acceptable for the entire period of this contract, provided the Engineer determines the PCQCP is for the same type of work that is to be performed on this contract.

An amended PCQCP or addendum shall be submitted to, and approved in writing by the Engineer, for any proposed revisions to the approved PCQCP. An amended PCQCP or addendum will be required for any revisions to the PCQCP, including but not limited to changes in concrete plants or source materials, changes in material testing procedures and testing labs, changes in procedures and equipment, changes in QC personnel, or updated systems for tracking and identifying precast elements. The Engineer shall have 2 weeks to complete the review of the amended PCQCP or addendum, once a complete submittal has been received. Work that is affected by any of the proposed revisions shall not be performed until the amended PCQCP or addendum has been approved.

After final approval of the PCQCP, amended PCQCP, or addendum, the Contractor shall submit 7 copies to the Engineer of each of these approved documents.

It is expressly understood that the Engineer's approval of the Contractor's PCQCP shall not relieve the Contractor of any responsibility under the contract for the successful completion of the work in conformance with the requirements of the plans and specifications. The Engineer's approval shall neither constitute a waiver of any of the requirements of the plans and specifications nor relieve the Contractor of any obligation thereunder; and defective work, materials, and equipment may be rejected notwithstanding approval of the PCQCP.

## **REPORTING**

The QC Inspector shall provide reports to the QCM on a daily basis for each day that precasting operations are performed.

A daily production log for precasting shall be kept by the QCM for each day that precasting operations, including setting forms, placing reinforcement, setting prestressing steel, casting, curing, post tensioning, and form release, are performed. The log shall include the facility location, and shall include a specific description of casting or related operations, any problems or deficiencies discovered, any testing or repair work performed, and the names of all QC personnel and the specific QC inspections they performed that day. The daily report from each QC Inspector shall also be included in the log. This daily log shall be available for viewing by the Engineer, at the precasting facility.

All reports regarding material tests and any required survey checks shall be signed by the person who performed the test or check, and then submitted directly to the QCM for review and signature prior to submittal to the Engineer. Corresponding names shall be clearly printed or type-written next to all signatures.

The Engineer shall be notified immediately in writing when any precasting problems or deficiencies are discovered and of the proposed repair or process changes required to correct them. The Engineer shall have 4 weeks to review these procedures. No remedial work shall begin until the Engineer approves these procedures in writing.

The following items shall be included in a precast report that is to be submitted to the Engineer following the completion of any precast element:

- A. Reports of all material tests and any required survey checks;
- B. Documentation that the Contractor has evaluated all tests and corrected all rejected deficiencies, and all repairs have been re-examined with the required tests and found acceptable; and
- C. A daily production log.

At the completion of any precast element, and if the QCM determines that element is in conformance with these special provisions, the QCM shall sign and furnish to the Engineer, a Certificate of Compliance in conformance with the provisions in Section 6-1.07, "Certificates of Compliance," of the Standard Specifications. This Certificate of Compliance shall be submitted with the precast report. The certificate shall state that all of the materials and workmanship incorporated in the work, and all required tests and inspections of this work, have been performed in

conformance with the details shown on the plans and the provisions of the Standard Specifications and these special provisions.

## **PAYMENT**

In the event the Engineer fails to complete the review of 1) a PCQCP, 2) an amended PCQCP or addendum, or 3) a proposed repair or process change, within the time allowed, and if, in the opinion of the Engineer, completion of the work is delayed or interfered with by reason of the Engineer's delay in completing the review, the Contractor will be compensated for any resulting loss, and an extension of time will be granted, in the same manner as provided for in Section 8-1.09, "Right of Way Delays," of the Standard Specifications.

All required repair work or process changes required to correct precasting operation deficiencies, whether discovered by the QCM, QC Inspector, or by the Engineer, and any associated delays or expenses to the Contractor caused by performing these repairs, shall be at the Contractor's expense.

Full compensation for conforming to the requirements of this section shall be considered as included in the contract prices paid for the various items of work involved and no additional compensation will be allowed therefor.

## **SECTION 8-3. WELDING**

### **8-3.01 WELDING**

#### **GENERAL**

Unless otherwise specified, Section 8-3, "Welding," shall apply to any welding that is specified to conform to an AWS welding code.

Requirements of the AWS welding codes shall apply unless otherwise specified in the Standard Specifications, on the plans, or in these special provisions. Wherever the abbreviation AWS is used, it shall be equivalent to the abbreviations ANSI/AWS or AASHTO/AWS.

Wherever reference is made to the following AWS welding codes in the Standard Specifications, on the plans, or in these special provisions, the year of adoption for these codes shall be as listed:

AWS Code	Year of Adoption
D1.1	2008
D1.3	2008
D1.4	2005
D1.5	2008
D1.6	2007
D1.8	2009

Flux cored welding electrodes conforming to the requirements of AWS A5.20 E6XT-4 or E7XT-4 shall not be used to perform welding for this project.

Unless otherwise specified, Clause 6.1.3 of AWS D1.1, paragraph 1 of Section 7.1.2 of AWS D1.4, and Clause 6.1.1.2 of AWS D1.5, are replaced with the following:

The QC Inspector shall be the duly designated person who acts for and on behalf of the Contractor for inspection, testing, and quality related matters for all welding.

Quality Assurance (QA) is the prerogative of the Engineer. The QA Inspector is the duly designated person who acts for and on behalf of the Engineer.

The QC Inspector shall be responsible for quality control acceptance or rejection of materials and workmanship.

When the term "Inspector" is used without further qualification, it shall refer to the QC Inspector.

Inspection and approval of all joint preparations, assembly practices, joint fit-ups, welding techniques, and the performance of each welder, welding operator, and tack welder shall be documented by the QC Inspector on a daily basis for each day welding is performed. For each inspection, including fit-up, Welding Procedure Specification (WPS) verification, and final weld inspection, the QC Inspector shall confirm and document compliance with the requirements of the AWS or other specified code criteria and the requirements of these special provisions on all welded joints before welding, during welding, and after the completion of each weld.

The Engineer shall have the authority to verify the qualifications or certifications of any welder, QC Inspector, or NDT personnel to specified levels by retests or other means approved by the Engineer.

When joint weld details that are not prequalified to the details of Clause 3 of AWS D1.1 or to the details of Figure 2.4 or 2.5 of AWS D1.5 are proposed for use in the work, the joint details, their intended locations, and the proposed welding parameters and essential variables, shall be approved by the Engineer. The Contractor shall allow the Engineer 15 days to complete the review of the proposed joint detail locations.

In addition to the requirements of AWS D1.1, welding procedure qualifications for work welded in conformance with this code shall conform to the following:

When a nonstandard weld joint is to be made using a combination of WPSs, a single test may be conducted combining the WPSs to be used in production, provided the essential variables, including weld bead placement, of each process are limited to those established in Table 4.5.

Upon approval of the proposed joint detail locations and qualification of the proposed joint details, welders and welding operators using these details shall perform a qualification test plate using the WPS variables and the joint detail to be used in production. The test plate shall have the maximum thickness to be used in production and a minimum length of 460 mm. The test plate shall be mechanically and radiographically tested. Mechanical and radiographic testing and acceptance criteria shall be as specified in the applicable AWS codes.

The Engineer will witness all qualification tests for WPSs that were not previously approved by the Department.

In addition to the requirements specified in the applicable code, the period of effectiveness for a welder's or welding operator's qualification shall be a maximum of 3 years for the same weld process, welding position, and weld type. If welding will be performed without gas shielding, then qualification shall also be without gas shielding. Excluding welding of fracture critical members, a valid qualification at the beginning of work on a contract will be acceptable for the entire period of the contract, as long as the welder's or welding operator's work remains satisfactory.

The Contractor shall notify the Engineer 7 days prior to performing any procedure qualification tests. Witnessing of qualification tests by the Engineer shall not constitute approval of the intended joint locations, welding parameters, or essential variables. The Contractor shall notify the Engineer using the "Standard TL-38 Inspection Form" located at:

<http://www.dot.ca.gov/hq/esc/Translab/OSM/smbforms.htm>

Clause 6.14.6, "Personnel Qualification," of AWS D1.1, Section 7.8, "Personnel Qualification," of AWS D1.4, and Clause 6.1.3.4, "Personnel Qualification," of AWS D1.5 are replaced with the following:

Personnel performing nondestructive testing (NDT) shall be qualified and certified in conformance with the requirements of the American Society for Nondestructive Testing (ASNT) Recommended Practice No. SNT-TC-1A and the Written Practice of the NDT firm. The Written Practice of the NDT firm shall meet or exceed the guidelines of the ASNT Recommended Practice No. SNT-TC-1A. Individuals who perform NDT, review the results, and prepare the written reports shall be either:

- A. Certified NDT Level II technicians, or;
- B. Level III technicians who hold a current ASNT Level III certificate in that discipline and are authorized and certified to perform the work of Level II technicians.

Clause 6.6.5, "Nonspecified NDT Other than Visual," of AWS D1.1, Section 7.6.5 of AWS D1.4 and Clause 6.6.5 of AWS D1.5 shall not apply.

For any welding, the Engineer may direct the Contractor to perform NDT that is in addition to the visual inspection or NDT specified in the AWS or other specified welding codes, in the Standard Specifications, or in these special provisions. Except as provided for in these special provisions, additional NDT required by the Engineer, and associated repair work, will be paid for as extra work as provided in Section 4-1.03D, "Extra Work," of the Standard Specifications. Prior to release of welded material by the Engineer, if testing by NDT methods other than those originally specified discloses an attempt to defraud or reveals a gross nonconformance, all costs associated with the repair of the deficient area, including NDT of the weld and of the repair, and any delays caused by the repair, shall be at the Contractor's expense. A gross nonconformance is defined as the sum of planar type rejectable indications in more than 20 percent of the tested length.

When less than 100 percent of NDT is specified for any weld, it is expected that the entire length of weld meet the specified acceptance-rejection criteria. Should any welding deficiencies be discovered by additional NDT directed or performed by the Engineer that utilizes the same NDT method as that originally specified, all costs

associated with the repair of the deficient area, including NDT of the weld and of the weld repair, and any delays caused by the repair, shall be at the Contractor's expense.

Repair work to correct welding deficiencies discovered by visual inspection directed or performed by the Engineer, and any associated delays or expenses caused to the Contractor by performing these repairs, shall be at the Contractor's expense.

### **WELDING QUALITY CONTROL**

Welding quality control shall conform to the requirements in the AWS or other specified welding codes, the Standard Specifications, and these special provisions.

Unless otherwise specified, welding quality control shall apply to work welded in conformance with the provisions in the following:

- A. Section 49, "Piling," Section 52, "Reinforcement," Section 55, "Steel Structures," and Section 75-1.035, "Bridge Joint Restrainer Units," of the Standard Specifications
- B. "Structural Steel for Building Work" of these special provisions

In addition, welding quality control shall apply when welding is performed for the following work:

- 1. Bike path expansion joint
- 2. PTFE spherical bearing

Unless otherwise specified, Clauses 6.1.4.1 and 6.1.4.3 of AWS D1.1, paragraph 2 of Section 7.1.2 of AWS D1.4, and Clauses 6.1.3.2 through 6.1.3.3 of AWS D1.5 are replaced with the following:

The QC Inspector shall be currently certified as an AWS Certified Welding Inspector (CWI) in conformance with the requirements in AWS QC1, "Standard for AWS Certification of Welding Inspectors."

The QC Inspector may be assisted by an Assistant QC Inspector provided that this individual is currently certified as an AWS Certified Associate Welding Inspector (CAWI) in conformance with the requirements in AWS QC1, "Standard for AWS Certification of Welding Inspectors." The Assistant QC Inspector may perform inspection under the direct supervision of the QC Inspector provided the assistant is always within visible and audible range of the QC Inspector. The QC Inspector shall be responsible for signing all reports and for determining if welded materials conform to workmanship and acceptance criteria. The ratio of QC Assistants to QC Inspectors shall not exceed 5 to 1.

The Contractor shall designate in writing a welding Quality Control Manager (QCM). The QCM shall be responsible directly to the Contractor for the quality of welding, including materials and workmanship, performed by the Contractor and subcontractors.

The QCM shall be the sole individual responsible to the Contractor for submitting, receiving, reviewing, and approving all correspondence, required submittals, and reports to and from the Engineer. The QCM shall be a registered professional engineer or shall be currently certified as a CWI.

Unless the QCM is hired by a subcontractor providing only QC services, the QCM shall not be employed or compensated by any subcontractor, or by other persons or entities hired by subcontractors, who will provide other services or materials for the project. The QCM may be an employee of the Contractor.

The QCM shall sign and furnish to the Engineer, a Certificate of Compliance in conformance with the provisions in Section 6-1.07, "Certificates of Compliance," of the Standard Specifications for each item of work for which welding was performed. The certificate shall state that all of the materials and workmanship incorporated in the work, and all required tests and inspections of this work, have been performed in conformance with the details shown on the plans, the Standard Specifications, and these special provisions.

Welding inspection personnel or NDT firms to be used in the work shall not be employed or compensated by any subcontractor, or by other persons or entities hired by subcontractors, who will provide other services or materials for the project, except for the following conditions:

- A. The work is welded in conformance with AWS D1.5 and is performed at a permanent fabrication or manufacturing facility that is certified under the AISC Quality Certification Program, Category CBR, Major Steel Bridges and Fracture Critical endorsement F, when applicable.
- B. Structural steel for building work is welded in conformance with AWS D1.1 and is performed at a permanent fabrication or manufacturing facility that is certified under the AISC Quality Certification Program, Category STD, Standard for Steel Building Structures.

For welding performed at such facilities, the inspection personnel or NDT firms may be employed or compensated by the facility performing the welding provided the facility maintains a QC program that is independent from production.

Unless otherwise specified, an approved independent third party will witness the qualification tests for welders or welding operators. The independent third party shall be a current CWI and shall not be an employee of the contractor performing the welding. The Contractor shall allow the Engineer 15 days to review the qualifications and copy of the current certification of the independent third party.

Prior to submitting the Welding Quality Control Plan (WQCP) required herein, a prewelding meeting between the Engineer, the Contractor's QCM, and a representative from each entity performing welding or inspection for this project, shall be held to discuss the requirements for the WQCP.

Information regarding the contents, format, and organization of a WQCP, is available at the Transportation Laboratory and at:

<http://www.dot.ca.gov/hq/esc/Translab/OSM/smbresources.htm>

The Contractor shall submit to the Engineer, in conformance with the provisions in "Working Drawings," of these special provisions, 2 copies of a separate WQCP for each subcontractor or supplier for each item of work for which welding is to be performed.

The Contractor shall allow the Engineer 15 days to review the WQCP submittal after a complete plan has been received. No welding shall be performed until the WQCP is approved in writing by the Engineer.

An amended WQCP or any addendum to the approved WQCP shall be submitted to, and approved in writing by the Engineer, for proposed revisions to the approved WQCP. An amended WQCP or addendum will be required for revisions to the WQCP, including but not limited to a revised WPS; additional welders; changes in NDT firms, QC, or NDT personnel or procedures; or updated systems for tracking and identifying welds. The Engineer shall have 10 working days to complete the review of the amended WQCP or addendum. Work affected by the proposed revisions shall not be performed until the amended WQCP or addendum has been approved.

After final approval of the WQCP, amended WQCP, or addendum, the Contractor shall submit 7 copies to the Engineer of the approved documents. A copy of the Engineer approved document shall be available at each location where welding is to be performed.

All welding will require inspection by the Engineer. The Contractor shall request inspection at least 3 business days prior to the beginning of welding for locations within California and 5 business days for locations outside of California. The Contractor shall request inspection at:

<http://www.dot.ca.gov/hq/esc/Translab/OSM/smbforms.htm>

Continuous inspection shall be provided when any welding is being performed. Continuous inspection, as a minimum, shall include having a QC Inspector within such close proximity of all welders or welding operators so that inspections by the QC Inspector of each welding operation at each welding location does not lapse for a period exceeding 30 minutes.

A daily production log for welding shall be kept for each day that welding is performed. The log shall clearly indicate the locations of all welding. The log shall include the welders' names, amount of welding performed, any problems or deficiencies discovered, and any testing or repair work performed, at each location. The daily report from each QC Inspector shall also be included in the log.

The following items shall be included in a Welding Report that is to be submitted to the Engineer within 15 days following the performance of any welding:

- A. A daily production log.
- B. Reports of all visual weld inspections and NDT.
- C. Radiographs and radiographic reports, and other required NDT reports.
- D. A summary of welding and NDT activities that occurred during the reporting period.
- E. Reports of each application of heat straightening.
- F. A summarized log listing the rejected lengths of weld by welder, position, process, joint configuration, and piece number.
- G. Documentation that the Contractor has evaluated all radiographs and other nondestructive tests and corrected all rejectable deficiencies, and that all repaired welds have been reexamined using the required NDT and found acceptable.

The following information shall be clearly written on the outside of radiographic envelopes: name of the QCM, name of the nondestructive testing firm, name of the radiographer, date, contract number, complete part description,

and all included weld numbers, report numbers, and station markers or views, as detailed in the WQCP. In addition, all interleaves shall have clearly written on them the part description and all included weld numbers and station markers or views, as detailed in the WQCP. A maximum of 2 pieces of film shall be used for each interleave.

Reports of all visual inspections and NDT shall be signed by the inspector or technician and submitted daily to the QCM for review and signature prior to submittal to the Engineer. Corresponding names shall be clearly printed or typewritten next to all signatures. Reports of all NDT, whether specified, additional, or informational, performed by the Contractor shall be submitted to the Engineer.

The Engineer will review the Welding Report to determine if the Contractor is in conformance with the WQCP. Except for field welded steel pipe piling, the Engineer shall be allowed 15 days to review the report and respond in writing after the complete Welding Report has been received. Prior to receiving notification from the Engineer of the Contractor's conformance with the WQCP, the Contractor may encase in concrete or cover welds for which the Welding Report has been submitted. However, should the Contractor elect to encase or cover those welds prior to receiving notification from the Engineer, it is expressly understood that the Contractor shall not be relieved of the responsibility for incorporating material in the work that conforms to the requirements of the plans and specifications. Material not conforming to these requirements will be subject to rejection.

For field welded steel pipe piling, including bar reinforcement in the piling, the Contractor shall allow the Engineer 2 business days to review the Welding Report and respond in writing after the required items have been received. No field welded steel pipe piling shall be installed, and no reinforcement in the piling shall be encased in concrete until the Engineer has approved the above requirements in writing.

In addition to the requirements in AWS D1.1 and AWS D1.5, third-time excavations of welds or base metal to repair unacceptable discontinuities, regardless of NDT method, and all repairs of cracks require prior approval of the Engineer.

The Engineer shall be notified immediately in writing when welding problems, deficiencies, base metal repairs, or any other type of repairs not submitted in the WQCP are discovered, and also of the proposed repair procedures to correct them. For requests to perform third-time excavations or repairs of cracks, the Contractor shall include an engineering evaluation of the proposed repair. The engineering evaluation, at a minimum, shall address the following:

- A. What is causing each defect?
- B. Why the repair will not degrade the material properties?
- C. What steps are being taken to prevent similar defects from happening again?

The Contractor shall allow the Engineer 7 days to review these procedures. No remedial work shall begin until the repair procedures are approved in writing by the Engineer.

Clause 6.5.4 of AWS D1.5 is replaced with the following:

The QC Inspector shall inspect and approve each joint preparation, assembly practice, welding technique, joint fit-up, and the performance of each welder, welding operator, and tack welder to make certain that the applicable requirements of this code and the approved Welding Procedure Specification (WPS) are met. The QC Inspector shall examine the work to make certain that it meets the requirements of Clauses 3 and 6.26. The size and contour of all welds shall be measured using suitable gages. Visual inspection for cracks in welds and base metal, and for other discontinuities shall be aided by strong light, magnifiers, or such other devices as may be helpful. Acceptance criteria different from those specified in this code may be used when approved by the Engineer.

In addition to the requirements of AWS D1.5, Clause 5.12 or 5.13, welding procedures qualification for work welded in conformance with that code shall conform to the following requirements:

- A. Unless considered prequalified, fillet welds shall be qualified in each position. The fillet weld soundness test shall be conducted using the essential variables of the WPS as established by the Procedure Qualification Record (PQR).
- B. For qualification of joints that do not conform to Figures 2.4 and 2.5 of AWS D1.5, a minimum of 2 WPS qualification tests are required. The tests shall be conducted using both Figure 5.1 and Figure 5.3. The test conforming to Figure 5.1 shall be conducted in conformance with AWS D1.5, Clause 5.12 or 5.13. The test conforming to Figure 5.3 shall be conducted using the welding electrical parameters that were established for the test conducted conforming to Figure 5.1. The ranges of welding electrical parameters established during welding per Figure 5.1 in conformance with AWS D1.5, Clause 5.12, shall be further restricted according to the limits in Table 5.3 during welding per Figure 5.3.



- C. Multiple zones within a weld joint may be qualified. The travel speed, amperage, and voltage values that are used for tests conducted per AWS D1.5 Clause 5.13 shall be consistent for each pass in a weld joint, and shall in no case vary by more than  $\pm 10$  percent for travel speed,  $\pm 10$  percent for amperage, and  $\pm 7$  percent for voltage as measured from a predetermined target value or average within each weld pass or zone. The travel speed shall in no case vary by more than  $\pm 15$  percent when using submerged arc welding.
- D. For a WPS qualified in conformance with AWS D1.5 Clause 5.13, the values to be used for calculating ranges for current and voltage shall be based on the average of all weld passes made in the test. Heat input shall be calculated using the average of current and voltage of all weld passes made in the test for a WPS qualified in conformance with Clause 5.12 or 5.13.
- E. Macroetch tests are required for WPS qualification tests, and acceptance shall be per AWS D1.5 Clause 5.19.3.
- F. When a nonstandard weld joint is to be made using a combination of WPSs, a test conforming to Figure 5.3 may be conducted combining the WPSs to be used in production, provided the essential variables, including weld bead placement, of each process are limited to those established in Table 5.3.
- G. Prior to preparing mechanical test specimens, the PQR welds shall be inspected by visual and radiographic tests. Backing bar shall be 75 mm in width and shall remain in place during NDT testing. Results of the visual and radiographic tests shall comply with AWS D1.5 Clause 6.26.2, excluding Clause 6.26.2.2. Test plates that do not comply with both tests shall not be used.

## **WELDING FOR OVERHEAD SIGN AND POLE STRUCTURES**

The Contractor shall meet the following requirements for any work welded in conformance with the provisions in Section 56-1, "Overhead Sign Structures," or Section 86-2.04, "Standards, Steel Pedestals and Posts," of the Standard Specifications.

Welding inspection personnel or NDT firms to be used in the work shall not be employed or compensated by any subcontractor, or by other persons or entities hired by subcontractors, who will provide other services or materials for the project, except for when the welding is performed at a permanent fabrication or manufacturing facility which is certified under the AISC Quality Certification Program, Category Sbd, Conventional Steel Building Structures.

### **Welding Qualification Audit**

Contractors or subcontractors performing welding operations for overhead sign and pole structures shall not deliver materials to the project without having successfully completed the Department's "Manufacturing Qualification Audit for Overhead Sign and Pole Structures," hereinafter referred to as the audit, not more than one year prior to the delivery of the materials. The Engineer will perform the audit. Copies of the audit form, and procedures for requesting and completing the audit, are available at the Transportation Laboratory or at:

<http://www.dot.ca.gov/hq/esc/Translab/smbresources.htm>

An audit that was approved by the Engineer no more than one year prior to the beginning of work on this contract will be acceptable for the entire period of this contract, provided the Engineer determines the audit was for the same type of work that is to be performed on this contract.

Successful completion of an audit shall not relieve the Contractor of the responsibility for furnishing materials or producing finished work of the quality specified in these special provisions and as shown on the plans.

### **Welding Report**

For work welded in conformance with the provisions in Section 56-1, "Overhead Sign Structures," or Section 86-2.04, "Standards, Steel Pedestals and Posts," of the Standard Specifications, a Welding Report shall be submitted in conformance with the provisions in "Welding Quality Control" of these special provisions.

## **STEEL PIPE PILING QUALIFICATION AUDIT**

The Contractor shall submit documentation that one of the following steel pipe piling qualification audits has been successfully completed before welding operations are performed, other than field welding, for steel pipe piling:

- A. "Class R Steel Pipe Piling Qualification Audit"
- B. "Class N Steel Pipe Piling Qualification Audit"

An audit shall have been completed for each pipe pile diameter, thickness, grade of steel, and class of piling to be supplied for this project. The procedures for requesting and completing the audit are available at:

<http://www.dot.ca.gov/hq/esc/Translab/OSM/smbresources.htm>

An audit that was approved by the Department no more than 3 years prior to the award of the contract will be acceptable for the entire period of this contract provided the Engineer determines the audit was for the same type of work that is to be performed on this contract.

A list of facilities that have successfully completed the audit and are authorized to provide material for this contract is available at:

[http://www.dot.ca.gov/hq/esc/Translab/OSM/smdocuments/Internet\\_auditlisting.pdf](http://www.dot.ca.gov/hq/esc/Translab/OSM/smdocuments/Internet_auditlisting.pdf)

Successful completion of an audit shall not relieve the Contractor of the responsibility for furnishing materials or producing finished work of the quality specified in these special provisions and as shown on the plans.

## **PAYMENT**

Full compensation for conforming to the requirements of "Welding" shall be considered as included in the contract prices paid for the various items of work involved and no additional compensation will be allowed therefor.

## **SECTION 9. DESCRIPTION OF BRIDGE WORK**

The bridge work to be done consists, in general, of constructing the following work as shown on the plans:

### **WEST TIE-IN PHASE 3 YBI EDGE BEAM SUPPORT STRUCTURE (YBIEBSS) (Bridge No 34-0006)**

Construct cast-in-place edge beam support structure and concrete columns under the existing structure.

### **WEST TIE-IN PHASE 3 WEST TIE-IN (DEMOLITION) (Bridge No 34-0006)**

Remove the existing structure.

### **SOUTH-SOUTH DETOUR VIADUCT (DEMOLITION) (Bridge No 34-0006)**

Remove the existing structure.

### **EAST TIE-IN (DEMOLITION) (Bridge No 34-0006)**

Remove the existing structure.

### **WEST TIE-IN PHASE 3 YBI VIADUCT DECK TREATMENT- (Bridge No 34-0006)**

Construct deck treatment and concrete barrier on existing bridge.

YBI EB ON-RAMP (FINAL)  
(Bridge No. 340006 S)

A five-span box girder bridge approximately 175 meters long and 12 meters wide. The superstructure consists of a prestressed concrete box girder. The substructure consists of reinforced concrete columns and footings supported by driven steel piles. A portion of the substructure was constructed under a previous contract.

YBI EB TRANSITION STRUCTURE (MOD)  
(Bridge No. 34-0006 R)

A bike path extension and removal of the existing Temporary Eastbound On-Ramp structure.

RETAINING WALL NO. 51  
(Bridge Number: 34E0015)

The major portion of the wall consists of steel soldier pile retaining wall with tie back anchors, concrete facing, architectural treatment (fractured rib texture), and a concrete barrier on a concrete barrier slab. The remaining portion of the wall consists of reinforced concrete cantilever wall with architectural treatment (fractured rib texture), and a concrete barrier.

RETAINING WALL NO. 52

Reinforced concrete retaining wall with architectural treatment (fractured rib texture), and a pedestrian railing.

CANTILEVER TRUSS DEMOLITION  
(Bridge No 34-0025)

Remove the existing cantilever truss bridge.

SELF-ANCHORED SUSPENSION BRIDGE  
(ERECTION OF BIKE PATH AT PIER W2)  
(Bridge No.34-0006)

Erect State-Furnished bike path at Pier W2.

YBI EDGE BEAM SUPPORT STRUCTURE ARCHITECTURAL EXTENSION  
(Bridge No. 34-0006)

Construct reinforced concrete edge beam architectural extension.

**SECTION 10. CONSTRUCTION DETAILS**

**SECTION 10-1. GENERAL**

**10-1.01 ORDER OF WORK**

Order of work shall conform to the provisions in Section 5-1.05, "Order of Work," of the Standard Specifications and these special provisions.

Any area that is cold planed in a work period shall be paved with the first layer of hot mix asphalt within the same work period before the area is opened to public traffic.

Any area that has existing epoxy asphalt concrete surfacing removed in a work period shall place the polyester concrete overlay within the same work period before the area is opened to public traffic.

Any area that has existing concrete deck surface removed in a work period shall place the polyester concrete overlay within the same work period before the area is opened to public traffic.

Bridge construction, jacking and removal sequence shall be according to the sequences shown on the plans.

Attention is directed to "Construction" of these special provisions regarding constructing a 600 mm by 600 mm test panel prior to constructing curb ramps with detectable warning surfaces.

Attention is directed to "Jointed Plain Concrete Pavement," of these special provisions regarding the requirement for Preparing Conference, and Just-In-Time Training.

Attention is directed to "Environmentally Sensitive Areas" and "Temporary Fence (Type ESA)" of these special provisions. Prior to beginning work, the boundaries of the Environmentally Sensitive Areas (ESA) shall be clearly delineated in the field. The boundaries shall be delineated by the installation of temporary fence (Type ESA).

The first order of work shall be to place the order for the electrical equipment. The Engineer shall be furnished a statement from the vendor that the order for the electrical equipment has been received and accepted by the vendor.

The uppermost layer of new pavement shall not be placed until all underlying conduits and loop detectors have been installed.

Prior to commencement of the traffic signal functional test at any location, all items of work related to signal control shall be completed and all roadside signs, pavement delineation, and pavement markings shall be in place at that location.

Attention is directed to "Maintaining Traffic" and "Temporary Pavement Delineation" of these special provisions and to the stage construction sheets of the plans.

Attention is directed to "Progress Schedule (Critical Path Method)" of these special provisions regarding the submittal of a general time-scaled logic diagram within 10 days after approval of the contract. The diagram shall be submitted prior to performing any work that may be affected by any proposed deviations to the construction staging of the project.

The work shall be performed in conformance with the stages of construction shown on the plans. Nonconflicting work in subsequent stages may proceed concurrently with work in preceding stages, provided satisfactory progress is maintained in the preceding stages of construction.

In each stage, after completion of the preceding stage, the first order of work shall be the removal of existing pavement delineation as directed by the Engineer. Pavement delineation removal shall be coordinated with new delineation so that lane lines are provided at all times on traveled ways open to public traffic.

Before obliterating any pavement delineation (traffic stripes, pavement markings, and pavement markers) that is to be replaced on the same alignment and location, as determined by the Engineer, the pavement delineation shall be referenced by the Contractor, with a sufficient number of control points to reestablish the alignment and location of the new pavement delineation. The references shall include the limits or changes in striping pattern, including one- and 2-way barrier lines, limit lines, crosswalks and other pavement markings. Full compensation for referencing existing pavement delineation shall be considered as included in the contract prices paid for new pavement delineation and no additional compensation will be allowed therefor.

Prior to applying hot mix asphalt concrete paving or polyester concrete overlay, the Contractor shall cover all manholes, valve and monument covers, grates, or other exposed facilities located within the area of application, using a plastic or oil resistant construction paper secured to the facility being covered by tape or adhesive. The covered facilities shall be referenced by the Contractor, with a sufficient number of control points to relocate the facilities after the hot mix asphalt concrete paving or polyester concrete overlay has been placed. After completion of the hot mix asphalt concrete paving or polyester concrete overlay operation, all covers shall be removed and disposed of in a manner satisfactory to the Engineer. Full compensation for covering manholes, valve and monument covers, grates, or other exposed facilities, referencing, and removing temporary cover shall be considered as included in the contract price paid per tonne for hot mix asphalt concrete or per square meter for polyester concrete overlay as listed in the Engineer estimate, and no additional compensation will be allowed therefor.

At those locations exposed to public traffic where guard railings or barriers are to be constructed, reconstructed, or removed and replaced, the Contractor shall schedule operations so that at the end of each working day there shall be no post holes open nor shall there be any railing or barrier posts installed without the blocks and rail elements assembled and mounted thereon.

Temporary railing (Type K) and temporary crash cushions shall be secured in place prior to commencing work for which the temporary railing and crash cushions are required.

At least 60 days before applying seeds, furnish the Engineer a statement from the vendor that the order for the seed required for this contract has been received and accepted by the vendor. The statement from the vendor must include the names and quantity of seed ordered and the anticipated date of delivery.

The Engineer designates ground locations of erosion control by directing the placing of stakes or other suitable markers before application of erosion control materials as specified under "Erosion Control (Type D)," "Erosion Control (Compost Blanket)," of these special provisions.

## **10-1.02 HEALTH AND SAFETY PLAN**

### **GENERAL**

This work includes preparing, submitting, and implementing a detailed Health and Safety Plan that addresses the health and safety of all field personnel, including State personnel.

The plan must identify potential health and safety hazards associated with existing hazardous substances and specify work practices to protect workers from those hazards. Comply with applicable Cal-OSHA regulations (Title 8, CA Code of Regs). At a minimum, the Health and Safety Plan must:

1. Identify key site safety personnel
2. Describe risks associated with the work
3. Describe training requirements
4. Describe appropriate personal protective equipment
5. Describe any site-specific medical surveillance requirements
6. Describe any periodic air monitoring requirements
7. Define appropriate site work zones
8. Describe any decontamination requirements

The Health and Safety Plan must be submitted at least 15 business days before beginning work that may expose personnel to hazardous substances for review and acceptance by the Engineer. Before submittal, you must have the Health and Safety Plan approved by an industrial hygienist certified by the American Board of Industrial Hygiene.

### **SAFETY TRAINING**

Before performing work that may expose personnel to hazardous substances, all personnel, including State personnel, must complete a safety training program that communicates the potential health and safety hazards associated with work on the site and instructs the personnel in procedures for doing the work safely. The level of training provided must be consistent with the personnel's job function and conform to CAL-OSHA regulations. Do not start safety training until the Health and Safety Plan is accepted by the Engineer. Provide subsequent refresher training required until completion of the project. Provide a certification of completion of the safety training program to all personnel who successfully complete the training. Provide personal protective equipment required by State personnel to inspect the work. The number of State personnel requiring the above mentioned safety training program and personal protective equipment is 10.

### **PAYMENT**

The contract lump sum price paid for health and safety plan includes full compensation for furnishing all labor, materials, tools, equipment, and incidentals and for doing all the work involved in preparing and implementing the Health and Safety Plan, complete in place, including safety training and personal protective equipment, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

## **10-1.03 TURBIDITY CONTROL**

### **GENERAL**

#### **Summary**

This work includes preparing a Turbidity Control Plan, monitoring of water quality and implementing control measures to limit transport of disturbed sediment during in-water construction operations as required by Regional Water Quality Control Board (RWQCB) Waste Discharge requirements (WDRs). Turbidity control includes:

1. Water Quality Sampling and Analysis including preparation, collection, analysis, and reporting of water quality sample results.
2. Implementing control measures to maintain Water Quality Objectives (WQOs) such as installation and maintenance of silt curtain during demolition, dredging, excavation, or fill placement in tidal receiving waters.
3. Preparing and submitting reports including visual inspection reports, monitoring reports, Water Quality Objective Exceedance reports, monitoring and inspection results, obtaining monitoring report acceptance, and providing reports required by the RWQCB.

This job lies within the boundaries of the San Francisco Bay Regional Water Quality Control Board (RWQCB). The receiving water for this job is San Francisco Bay.

## Definitions and Abbreviations

**turbidity:** A physical characteristic of water that is an expression of the optical property that causes light to be scattered and absorbed by particles and molecules rather than transmitted in straight lines through a water sample. Suspended matter or impurities that interfere with the clarity of the water cause turbidity. These impurities may include clay, silt, and finely divided inorganic and organic matter.

**natural background turbidity:** The ambient clarity of the water adjacent to the job site at locations not affected by the work.

**nephelometric turbidity units (NTU):** A standard measure of turbidity based on light scatter measured with a nephelometer.

**receiving water:** The water in or adjacent to the job site that may be impacted by sediment disturbance caused by construction activities.

**WQM:** Water Quality Monitor. The WQM collects water quality sampling data and provides reports to the Engineer.

**WQO:** Water Quality Objective.

## Submittals

Within 7 days after contract approval, submit WQM qualifications including training and experience in collecting and analyzing water quality samples.

Submit plans and working drawings for turbidity control measures. Furnish three initial copies of the plans and working drawings to the Engineer and equal number of copies following subsequent revisions and updating. Final approval of the plans and working drawings is subject to field testing.

At least 60 days before beginning work in marine environments, start the following process for Turbidity Control Plan approval:

1. Submit 5 copies of the Turbidity Control Plan and allow 30 days for the Engineer's review. If revisions are required, the Engineer provides comments and specifies the date that the review stopped.
2. Change and resubmit the Turbidity Control Plan within 15 days of receipt of the Engineer's comments. The Engineer's review resumes when the complete Turbidity Control Plan is resubmitted.
3. When the Engineer approves the Turbidity Control Plan, submit 5 compact discs (CDs) and 5 printed copies of the approved Turbidity Control Plan.
4. The Engineer submits copies of the approved Turbidity Control Plan to the RWQCB and the BCDC for their review and comment.
5. If the San Francisco RWQCB and BCDC provide comments on the Turbidity Control Plan, amend the Turbidity Control Plan. Upon approval, incorporate the Turbidity Control Plan into the approved SWPPP using the established amendment process specified in "Water Pollution Control," of these special provisions.

The Turbidity Control Plan must describe:

1. Equipment and activities used to do in-water work,
2. Operation schedule,
3. Description of deployment of turbidity control measures, including water pollution control drawings depicting locations of turbidity control activities.
4. Containment contingency,
5. Turbidity Monitoring Program shall include:
  - 5.1. Inspection procedures
  - 5.2. Monitoring processes and methods
  - 5.3. Monitoring equipment to be used
  - 5.4. Monitoring logs templates
  - 5.5. Reporting procedures
  - 5.6. Report templates

The Turbidity Monitoring Program must include daily inspection reports during in-water work. The reports must document water quality measurements, visual observations, including photographs, and inspection results.

Incorporate Turbidity Control Plan into the SWPPP.

The State is not liable for failure to accept all or any portion of an originally submitted or revised Turbidity Control Plan, nor for any delays to the work due to failure to submit an acceptable turbidity control plan.

Submit an electronic copy and 2 printed copies of Monitoring Reports as required:

1. Water Quality Monitoring Reports
2. Other reports required by the RWQCB

### **Quality Control and Assurance**

#### **Training**

Training for personnel to collect water quality samples must include:

1. SAP review
2. Health and safety review
3. Sampling simulations
4. Turbidity Control Plan review

#### **Water Quality Monitor (WQM)**

The WQM must have the same qualifications as the WPC Manager including the requirements for QSD described in the Permit (Order No. 2009-0009-DWQ, NPDES No. CAS000002).

The WQM must have training and experience in collecting and analyzing water quality samples.

The WQM may be the same person as the WPC Manager.

### **IMPLEMENTATION REQUIREMENTS**

#### **Operation**

Implement turbidity control measures to ensure that in-water work complies with regulatory rules, policies, and permits. All in-water work that can cause turbidity must have

Implement turbidity control measures for work that has the potential to cause turbidity within 100 meters of a land-based ESA boundary. The following control measures, as a minimum, must be installed and maintained within this 100 meter zone:

1. Install an engineered turbidity control curtain along the ESA boundary or around the perimeter of the work to reduce sediment transport to the ESA. The curtain materials and connections must be able to withstand 0.8-m/s (1.5-kt) currents (flood and ebb), wind, waves, and vessel wakes. At least one end of the curtain must be anchored on shore above the highest expected tide elevation. If possible, anchor both ends of the curtain on shore. The intermediate sections of the curtain must be anchored in a manner that does not submerge the top of the curtain at high tide.

If the control measures fail to maintain WQOs in accordance with regulatory permits, then:

1. Modify construction practices to minimize sediment disturbances and drift.
2. Modify size and type of marine equipment employed.
3. Conduct work during tidal periods that result in sediment transport away from the ESA.
4. Implement additional BMPs and corrective actions to manage the WQO exceedance

#### **Visual Monitoring**

Before starting in-water work the WQM must inspect and document the existing condition of the receiving waters. Provide photo documentation of the surrounding work area extending 61.0 meters upstream and 61.0 meters downstream of the work.

Observe receiving waters:

1. 24 hours before beginning in-water work including the installation of clear water diversions
2. At least four times daily during in-water work activities including the installation, operation, and removal of turbidity control measures

Complete a daily inspection of the receiving water during in-water work. Observations must include:

1. The presence or absence of:
  - 1.1 Discoloration;
  - 1.2 Odor
  - 1.3 Floating or suspended material
  - 1.4 Aquatic life
  - 1.5 Visible films, sheens or coatings
  - 1.6 Potential nuisance conditions
2. The wind direction and velocity
3. Tidal state
4. Time and date

The WQM must prepare visual inspection reports that include the following:

1. Name of personnel performing the inspection, inspection date and time, and date and time of the completed inspection report.
2. Storm and weather conditions
3. Locations and observations
4. Corrective actions taken

Retain visual inspections reports at the job site.

### **Water Quality Sampling**

Perform water quality sampling whenever a project activity, conducted within waters of the State, has the potential to mobilize sediment or alter background conditions within waters of the State. Perform surface water quality sampling when:

1. Conducting in-water work
2. Work activities result in materials reaching receiving waters
3. Work activities result in the creation of a visible plume in receiving waters

Perform sampling for WQOs in conformance with regulatory rules, policies, permits, and a Turbidity Monitoring Program described in the Turbidity Control Plan.



This project is subject to WQOs:

Parameter	Test Method	Detection Limit (Min)	Unit	Water Quality Objective
Turbidity (during activities for in-water work)	Field test with calibrated portable instrument (Measured at downstream sampling location)	1	NTU	Where natural background turbidity is less than 50 NTUs, increase must not exceed 50 NTUs
Turbidity (during activities for in-water work)	Field test with calibrated portable instrument (Measured at downstream sampling location)	1	NTU	Where natural background turbidity is greater than 50 NTUs, increases must not exceed 10 percent
pH	Field test with calibrated portable instrument	0.2	pH units	Lower WQO = 6.5 Upper WQO = 8.5 And any change greater than 0.5 units above natural background
Temperature	Field test with calibrated portable instrument	1	Degrees Centigrade (C)	Must not exceed 2.8 degrees above natural background
Dissolved Oxygen	Field test with calibrated portable instrument	1	Milligrams per liter (mg/L)	Must not be reduced less than 5.0 mg/L
Dissolved Sulfide	EPA 376.2	--	Milligrams per liter (mg/L)	Must not exceed 0.1 mg/L
Total Suspended Solids	EPA 160.2	--	Milligrams per liter (mg/L)	none

#### Water Quality Measurements

At least 24 hours before beginning in-water work:

1. Establish locations for water quality sampling
2. Conduct water quality sampling to document background conditions for upstream, effluent, and downstream locations. Sample for each WQO described above.

Measure WQOs during in-water work as follows:

1. Take measurements at the background and receiving water sampling locations one hour before starting the work to assess the relative conditions in the receiving water.
2. Start measuring in the receiving water 15 minutes after starting the work.
3. Measure every 24 hours during the work.
4. Take additional measurements whenever there is a noticeable effect on the color or clarity of the receiving water.
5. If a measurement exceeds the water quality limitations, confirm the exceedance by taking an additional measurement no more than 60 minutes after the initial measurement and confirm that the natural background condition has not changed. Continue hourly sampling until WQOs are restored.
6. Monitoring may be discontinued if, in the opinion of the Engineer, the receiving water measurements are consistently below the water quality limitations.
7. Measure the receiving water within 91.4 meters downstream (with the tide) of the work.
8. Measure the natural background turbidity at a location that is unaffected by the work, at least 30.5 meters upstream (against the tide) of the work.

The receiving water and natural background measurements must be depth-averaged when the water depth is greater than 0.9 meters. Obtain depth-averaged measurements by taking measurements from 3 points within the water column and averaging the 3 measurements: one at 0.3 meters below the surface, one at mid depth, and one at 0.3 meters above the bottom. In receiving waters that are less than 0.9 meters in depth, only one measurement must be taken at 0.3 meters below the surface.

Obtain field-recorded data using a meter approved by the Engineer. The meter must be a handheld direct-reading instrument connected to a submersible turbidity sensor. Submit a copy of the manufacturer specifications for all measuring instruments used, including the operating instructions, calibration instructions, and calibration log, as part of the turbidity control plan submittal. Perform all field calibrations in conformance with the manufacturer's instructions in the presence of the Engineer. Transmit copies of the field-recorded data electronically to the Engineer at the end of each working day.

Samples taken for laboratory analysis must follow water quality sampling procedures and be analyzed by a State-certified laboratory under 40 CFR Part 136, "Guidelines Establishing Test Procedures for the Analysis of Pollutants."

The SAP must identify the State-certified laboratory, sample containers, preservation requirements, holding times, and analysis method. For a list of State-certified laboratories, go to:

<http://www.cdph.ca.gov/certlic/labs/Pages/ELAP.aspx>

## **REPORTING REQUIREMENTS**

### **Monitoring Report**

The WQM must prepare a monitoring report. Submit the monitoring report by the 7th of the month for monitoring work conducted during the previous month. Submit monitoring reports monthly. The report must include:

1. Visual monitoring inspection reports
2. If in-water work was done, include the following field sampling results and inspections:
  - 2.1. Analytical methods, reporting units, and detection limits
  - 2.2. Date, location, time of sampling, visual observation, photos, and measurements
  - 2.3. Estimate of water flow
  - 2.4. Calibration logs for field monitoring equipment
3. Summary of exceedance
4. Summary of corrective actions

The WQM must prepare other RWQCB reports when:

1. Conducting in-water work
2. Work activities cause a discharge of materials reaching receiving waters
3. Work activities cause a discharge resulting in the creation of a visible plume in receiving waters

Follow the monitoring report requirements for other RWQCB reports. The other RWQCB reports must be submitted within 3 days of beginning in-water work or discovery of a discharge and continue every 2 weeks. Suspend the other RWQCB reports 2 weeks after concluding in-water work or correction of the discharge.

### **WQO Exceedance Report**

If a WQO is exceeded, the WQM must 1) notify the Engineer by phone or electronic media within 30 minutes of WQO is exceeded and 2) submit a WQO Exceedance Report within 6 hours of WQO is exceeded. The report must:

1. Include the following field sampling results and inspections:
  - 1.1. Analytical methods, reporting units, and detection limits
  - 1.2. Date, location, time of sampling, visual observation, photos, and measurements
  - 1.3. Estimate of water flow
  - 1.4. Name of personnel taking samples and title.

## 2. Description of BMPs and corrective actions taken to manage WQO exceedance

### **Removal**

Remove and dispose of turbidity control measures under Section 7-1.13, "Disposal of Material Outside the Highway Right of Way," of the Standard Specifications.

### **MEASUREMENT AND PAYMENT**

The contract lump sum price paid for turbidity control includes full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in turbidity control, complete in place, including development and submittal of the Turbidity Control Plan, producing daily inspection and monitoring reports, and removal and disposal of all control measures when no longer necessary, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

## **10-1.04 DEWATERING AND NON-STORM WATER DISCHARGE CONTROL**

### **GENERAL**

#### **Summary**

This work includes collection, conveyance, treatment, and discharge or disposal of accumulated precipitation and groundwater encountered during excavations for structures, roadways, and appurtenances. Site investigations within the project area have determined that contaminant levels of petroleum hydrocarbons, metals and other constituents exist therefore water discharges are subject to regulatory restrictions.

The Contractor must design, implement, monitor, maintain, and later remove a dewatering and non-storm water discharge treatment system in compliance with "Water Pollution Control," and "Construction Site Management," of these special provisions. Maintenance includes disposal of sediments and other material removed from the collection, conveyance and treatment systems.

The Department's "Storm Water Pollution Prevention Plan (SWPPP) and Water Pollution Control Program (WPCP) Preparation Manual" (Preparation Manual) are available at:

[http://www.dot.ca.gov/hq/construc/stormwater/SWPPP\\_Prep\\_ManualJune2011.pdf](http://www.dot.ca.gov/hq/construc/stormwater/SWPPP_Prep_ManualJune2011.pdf)

Discharge groundwater, impounded construction site water, or both, using any of the following methods:

1. Discharge into a Publicly Owned Treatment Works (POTW) facility (sanitary sewer) under a batch discharge permit. Apply for and comply with the provisions contained in the permit and pay all fees assessed by the POTW facility in connection with the discharge.
2. Discharge into a storm drain system under Order No. R2-2012-0012 adopted by the San Francisco Bay Regional Water Quality Control Board (RWQCB). Comply with "Relations with California Regional Water Quality Control Board," of these special provisions for discharges to the storm drain system. If the discharge is to the storm drain system, comply with the provisions of Order No. R2-2012-0012 and pay all fees in connection with obtaining coverage under the Order No. R2-2012-0012.
3. Use water treated under Order No. R2-2012-0012 for dust control.
4. Percolate water treated under Order No. R2-2012-0012 into soil in inactive work areas.

Maintain copies of the permits at the job site and make them available during construction.

#### **Submittals**

Before discharging submit:

1. Dewatering and Discharge plan
2. POTW permit if applicable
3. Notice of Intent (NOI) of discharge under Order No. R2-2012-0012 if applicable
4. A report describing each component of the planned Groundwater Treatment System and an Operation and Maintenance Manual in conformance with Order No. R2-2012-0012 and these special provisions if applicable

## Dewatering and Discharge Plan

The Dewatering and Discharge Plan (DDP) must include:

1. Title sheet
2. Table of contents
3. Certification and approval sheet (Section 100 of the Preparation Manual)
4. Amendment log and format (Section 200 of the Preparation Manual)
5. Description and schedule of the dewatering and discharge operations
6. Description of discharge alternatives, including POTW, dust control, percolation, storm sewers, and surface waters
7. Description of any treatment system components including an Operations and Maintenance Manual providing for all requirements in the applicable Discharge Permit
8. If you use chemical coagulants, in-line flocculants, or both, in the treatment system, submit a Coagulant Pollution Prevention Plan (CPPP) with the DDP.

The CPPP must include:

- 8.1. Description of the best management practices (BMPs) to prevent:
  - 8.1.1. Accidental spillage
  - 8.1.2. Overfeeding into the treatment system
  - 8.1.3. Other mishandling of coagulant agents
- 8.2. Coagulant monitoring plan that complies with the following Residual Chemical and Toxicity Requirements:
  - 8.2.1. The discharger shall utilize a residual chemical test method that has a method detection limit (MDL) of 10% or less than the maximum allowable threshold concentration (MATC) for the specific coagulant in use and for the most sensitive species of the chemical used.
  - 8.2.2. The discharger shall utilize a residual chemical test method that produces a result within one hour of sampling.
  - 8.2.3. The discharger shall have a California State certified laboratory validate the selected residual chemical test. Specifically the lab will review the test protocol, test parameters, and the detection limit of the coagulant. The discharger shall electronically submit this documentation as part of the ATS Plan.
  - 8.2.4. If the discharger cannot utilize a residual chemical test method that meets the requirements above, the discharger shall operate the ATS in Batch Treatment 4 mode
  - 8.2.5. A discharger planning to operate in Batch Treatment mode shall perform toxicity testing in accordance with the following:
    - 8.2.5.1. The discharger shall initiate acute toxicity testing on effluent samples representing effluent from each batch prior to discharge 5. All bioassays shall be sent to a laboratory certified by the Department of Health Services (DHS) Environmental Laboratory Accreditation Program (ELAP). The required field of testing number for Whole Effluent Toxicity (WET) testing is E113.6.
    - 8.2.5.2. Acute toxicity tests shall be conducted with the following species and protocols. The methods to be used in the acute toxicity testing shall be those outlined for a 96-hour acute test in "Methods for Measuring the Acute Toxicity of Effluents and Receiving Water to Freshwater and Marine Organisms, USEPA-841-R-02-012" for Fathead minnow, *Pimephales promelas* (fathead minnow). Acute toxicity for *Oncorhynchus mykiss* (Rainbow Trout) may be used as a substitute for testing fathead minnows.
    - 8.2.5.3. All toxicity tests shall meet quality assurance criteria and test acceptability criteria in the most recent versions of the EPA test method for WET testing.
    - 8.2.5.4. The discharger shall electronically report all acute toxicity testing.

- 8.3. Description of the agent (chemical and trade name description)  
Chemical coagulants and flocculants proposed for use in the treatment of non-storm water must comply with the following:

- 8.3.1. Jar tests shall be conducted using water samples selected to represent typical site conditions and in accordance with ASTM D2035-08 (2003).
- 8.3.2. The discharger shall conduct, at minimum, six site-specific jar tests (per polymer with one test serving as a control) for each project to determine the proper polymer and dosage levels for their ATS.
- 8.3.3. Single field jar tests may also be conducted during a project if conditions warrant, for example if construction activities disturb changing types of soils, which consequently cause change in storm water and runoff characteristics.

- 8.4. Pure product freshwater and marine aquatic toxicity data for the agent

- 9. Estimated flow rates
- 10. Operation and system maintenance procedures and example maintenance log for any treatment system
- 11. Field-recorded data, visual inspection, and calibration procedures and example logs including a sample Daily Inspection Report form
- 12. Measuring equipment descriptions
- 13. Working drawings of dewatering and discharge operations showing:
  - 13.1. Section and plan views of any effluent treatment system
  - 13.2. Location of sampling points for water quality measurements
  - 13.3. Flow path and placement of pipes, hoses, pumps, holding tanks, and other equipment used to convey water
  - 13.4. General position of dewatering, and discharge components relative to excavations or other operations requiring dewatering
  - 13.5. Point of discharge

Within 30 days after contract approval, submit 3 copies of the DDP to the Engineer. Allow 30 days for the Engineer's review. If revisions are required, the Engineer will provide comments and specify the date that the review stopped. Revise and resubmit the DDP within 7 days of receipt of the Engineer's comments. The Engineer's review will resume when the complete DDP is resubmitted. When the Engineer approves the DDP, submit 4 copies with compact discs of the approved DDP to the Engineer. After approval, the Engineer will submit one copy of the approved DDP to the RWQCB for their review and comment. If the RWQCB provides comments to the DDP, the Contractor must amend the DDP. Dewatering activities may begin no sooner than 45 days after the Engineer approves the DDP. If the Engineer fails to complete the review within the time allowed and if, in the opinion of the Engineer, completion of the work is delayed or interfered with because of the Engineer's or the RWQCB's review, you will be compensated for resulting losses, and an extension of time will be granted, as provided for in Section 8-1.09, "Right of Way Delays," of the Standard Specifications.

A Storm Water Information Handout has been prepared for this contract and is available as described in "Supplemental Project Information" of these special provisions. This Information Package includes:

- 1. Estimated groundwater seepage rates in the project area
- 2. RWQCB General Waste Discharge Requirements for Order No. R2-2012-0012, NPDES General Permit No. CAG912002
- 3. Local POTW facility information
- 4. Soil and groundwater sampling results

## **MATERIALS**

### **Non-Storm Water Treatment and Discharge System**

Design and implement an appropriate water treatment system for the site conditions and your estimated flow rate to achieve and maintain compliance with receiving water limitations and discharge effluent limitations. System components may include:

- 1. Treatment system.
- 2. Collection and conveyance system.

3. Temporary holding tanks.
4. Discharge attenuator.

### **Treatment Systems**

Treatment systems must be designed to remove turbidity-producing suspended solids and petroleum hydrocarbons as listed in the soil and groundwater sampling results.

Attention is directed to "Supplemental Project Information," of these special provisions for obtaining a copy of the Site Investigation Report.

Primary and secondary treatment may be required, or the design of the treatment system may require combined use of the various treatment components in series to achieve effective treatment. Ensure that the treatment system components are steam cleaned to remove any residual contaminants. Treatment system components may include:

1. Desilting basins
2. Weir tanks
3. Settling tanks
4. Sediment traps
5. Gravity bag filters
6. Sand media filters
7. Pressurized bag filters
8. Cartridge filters
9. In-line chemical coagulants and/or flocculants
10. Activated clay filters
11. Activated carbon filters
12. A combination of these systems to provide primary and secondary treatment

Chemical coagulants and/or flocculants proposed for use in the treatment of groundwater must be approved by the RWQCB. You are fully and solely responsible for securing approval from the RWQCB. Written approval from the RWQCB must be submitted to the Engineer for review prior to any use of flocculants on this project. The Information Package includes an outline of the information required by the RWQCB for approval of the chemical coagulants and/or flocculants for use in the Treatment System.

Disposal of sediments removed during maintenance of the Treatment System must comply with Section 7-1.13, "Disposal of Material Outside the Highway Right of Way," of the Standard Specifications.

If necessary, treat water discharged to surface water or storm drainage systems to adjust the pH, dissolved oxygen, and residual chemicals introduced by the treatment system. Treatment for water with high pH may include the addition of carbon dioxide, sulfuric acid, phosphoric acid, citric acid, or nitric acid in conformance with the supplier's specifications. Treatment for water with low pH may include filtration through a limestone bed or the addition of sodium hydroxide. Treatment for water with low dissolved oxygen may include aeration.

The various components must be maintained to prevent leaks and provide proper function. If a component of the dewatering equipment is not functioning properly, the dewatering operation must be discontinued and the component must be repaired or replaced.

### **Collection and Conveyance System**

Provide all pumps and piping to convey the water to temporary holding tanks and the point of discharge.

Use a flow meter, as described in "Flow Rate Monitoring" of this section, to measure all discharges from dewatering operations.

Materials must conform to the provisions in Section 6, "Control of Materials," Section 7-1.16, "Contractor's Responsibility for the Work and Materials," and Section 74-2, "Drainage Pumping Equipment," of the Standard Specifications and these special provisions.

### **Temporary Holding Tanks**

Water pumped during dewatering operations must be stored in temporary holding tanks placed at the work area for treatment to remove sediment.

Use temporary holding tanks including transportable closed top holding tanks or tanker trucks. A sufficient number of holding tanks shall be provided based on the following:

1. Anticipated flow rate
2. Pumping rates
3. Capacity inefficiencies due to sediment retention within the holding tanks

4. Sediment settling rates
5. Sediment removal frequency
6. Anticipated water loss or reuse rates

Provide temporary holding tanks with a holding capacity sufficient to handle the water removed from dewatering operations, and prevent delay of work.

Each temporary holding tank must have an inlet and outlet capable of receiving and discharging flows at a sufficient rate to dewater the excavation.

Maintain a minimum freeboard of 0.3 meter in each of the temporary holding tanks at all times. Clean the holding tanks when 25 percent of the tank's volume is filled with sediments.

## **CONSTRUCTION**

### **Discharging Water**

Use discharged treated water or uncontaminated ground or surface water for dust control in active work areas when possible, or discharge the water to an inactive area where the grade prevents sheet flow and the soil will allow percolation. The discharge point in the inactive area must include a velocity dissipater. The discharge volume must not exceed the area's capacity for percolation.

Do not discharge into a body of water where erosion, scour, or sedimentary deposits could occur that impact natural bedding or aquatic life. Monitor the water at the discharge point using water quality measurements and visual observation in conformance with the regulatory permit and these special provisions.

Storm water must be diverted away from excavations that would require dewatering.

### **Inspection, Monitoring, and Reporting**

If treated groundwater is discharged to the storm drain system, perform compliance monitoring in conformance with the Monitoring and Reporting Program (MRP) included in Attachment E of the Order No. R2-2012-0012. If a batch discharge permit is obtained from a POTW, comply with the provisions contained in the batch discharge permit including all monitoring and reporting requirements.

During periods when the dewatering and non-storm water discharge operations occur, document the results in a Daily Inspection Report (DIR). The DIR form must include the discharge volume records and water quality monitoring records. In developing the DIR, refer to the Department's Dewatering Guide. The DIR form must be approved by the Engineer before use. The DIR must be provided weekly or as directed to the Engineer.

All information and recorded data collected or submitted as part of the DIR must be certified as true and accurate and signed by those who gather the information.

### **Visual Inspection**

During each day of discharge, perform daily inspection of the effluent at the discharge site and include, in the DIR, observations of:

1. Date and Time.
2. Weather conditions,
3. Wind direction and velocity,
4. The presence or absence of water fowl or aquatic wildlife,
5. The color and clarity of the effluent discharge, and
6. Erosion or ponding downstream of the discharge site.

The DIR must include photographs of the discharge point and areas downstream of the discharge location. These photographs must be labeled with the time, date, and location.

### **Flow Rate Monitoring**

A flow meter that has been approved by the Engineer for exclusive use in dewatering during construction must be used to measure all excavation discharges. All calibrations must be done in conformance with the manufacturer's instructions in the presence of the Engineer.

Record the flow-meter totalizer readings and compute average daily volumes for every day that dewatering is conducted.

## **Penalties and Withholdings**

Know and comply with provisions of Federal, State, and local regulations and requirements that govern the work and storm water and non-storm water discharges from the job site and areas of disturbance outside the project limits during construction under Section 7-1.01, "Laws to be Observed," Section 7-1.11, "Preservation of Property," and Section 7-1.12, "Indemnification and Insurance," of the Standard Specifications.

You are responsible for all penalties assessed as a result of your failure to comply with the provisions in "Water Pollution Control" of these special provisions or with the applicable provisions of the Federal, State, and local regulations and requirements.

Penalties include fines, penalties, and damages, whether proposed, assessed, or levied against the Department or you, including those levied under the Federal Clean Water Act and the State Porter-Cologne Water Quality Control Act, by governmental agencies or as a result of citizen suits. Penalties also include payments made or costs incurred in settlement for alleged violations of applicable laws, regulations, or requirements. Costs incurred could include sums spent instead of penalties, in mitigation or to remediate or correct violations.

The Department withholds payment, in an amount estimated by the Department, to include the full amount of penalties and mitigation costs proposed, assessed, or levied as a result of a violation of the permits, or Federal or State law, regulations, or requirements. Funds will be withheld until final disposition of these costs has been made. You remain liable for the full amount until the potential liability is finally resolved with the entity seeking the penalties. Instead of the withhold, you may provide a suitable bond in favor of the Department to cover the highest estimated liability for any disputed penalties proposed as a result of the violation of the permits, law, regulations, or requirements.

If a regulatory agency identifies a violation of the permits and modifications thereto, or other Federal, State, or local requirements, the Department will withhold payment as follows:

1. The Department will give you 30 days notice of the Department's intention to withhold funds from payments that may become due before acceptance of the contract. After acceptance of the contract, funds will be withheld without prior notice.
2. If the amount being withheld from partial payments under Section 9-1.06, "Partial Payments," of the Standard Specifications exceeds the amount to be withheld for violations, no additional payment will be withheld.
3. If the Department withholds funds and it is subsequently determined that the State is not subject to the entire amount of the costs and liabilities assessed or proposed in connection with the matter for which the withhold was made, the Department will return the excess amount withheld in the progress payment following the determination. If the matter is resolved for less than the amount withheld, the Department will pay interest at a rate of 6 percent per year on the excess withhold.

Notify the Engineer immediately upon request from a regulatory agency to enter, inspect, sample, monitor, or otherwise access the job site or obtain records pertaining to water pollution control work. Provide copies of correspondence, notices of violation, enforcement actions, or proposed fines by regulatory agencies to the requesting regulatory agency.

## **PAYMENT**

The contract lump sum price paid for dewatering and non-storm water discharge control includes full compensation for furnishing all labor, materials, tools, equipment, and incidentals and for doing all the work involved in dewatering, including preparing the dewatering and discharge plan, implementing the MRP, obtaining all required permits, payment of fees for all permits and payment for discharge fees for disposal of treated water and sediments removed during maintenance of the treatment system as specified in the Standard Specifications, and these special provisions, and as directed by the Engineer.

## **10-1.05 WORKING DRAWING SUBMITTAL SCHEDULE**

Attention is directed to "Working Drawings" in these special provisions.

The Contractor shall submit the working drawing submittal schedule in accordance with the requirements of these special provisions.

The Contractor's attention is directed to the section "Progress Schedule (Critical Path Method)" of these special provisions for the definitions of Baseline Schedule and Controlling Operation.

Within 6 weeks days after approval of the contract, the Contractor shall submit to the Engineer for acceptance the working drawing submittal schedule in conjunction with the Baseline Schedule. The working drawing submittal schedule shall include the following:



- A. Name and brief description of all working drawings and supplements including all subsections required by the Standard Specifications and these special provisions.
- B. Reference section of the Standard Specifications or these special provisions for each working drawing submittal.
- C. Allowable time for review of the working drawings by the Engineer as specified in the Standard Specifications and these special provisions.
- D. A time-scaled logic diagram which shows all working drawing submittals, working drawing activities, and demonstrates any interdependency between separate working drawing submittals or partial submittals.
- E. A listing of all working drawing submittals affecting the Controlling/critical path Operation.
- F. Identification of the first occurrence of any Controlling/critical path Operation affected by each working drawing submittal.
- G. A time-scaled diagram showing the estimated number of working drawing submittal sheets to be submitted for the Engineer's review.
- H. In the event that several related working drawing submittals with review times on the controlling/critical path are submitted simultaneously, or an additional working drawing submittal is submitted for review before the review of a previous submittal has been completed, the Contractor shall designate the sequence in which the submittals are to be reviewed.

The Contractor's proposed working drawing submittal schedule shall be in the order of the activities listed in the Baseline Schedule. Working drawing submittal schedules in contradiction with the Baseline Schedule will not be accepted. Items D through H above, of the working drawing submittal schedule, shall be updated and submitted to the Engineer on a monthly basis in conjunction with the monthly updates provided for under Progress Schedule (Critical Path Method). The working drawing submittal schedule updates shall reflect actual durations and proposed revisions in durations, resources, and logic.

No compensation will be allowed for any costs incurred or for delay in completing the work resulting from rejected working drawing submittal. Pursuant to Item H above, of the working drawing submittal schedule, should the Contractor submit several related working drawing submittals with review times on the controlling/critical path, or an additional working drawing submittal for review before the review of a previous submittal has been completed, the time to be provided for the review of any submittal in the sequence shall be not less than the review time specified for that submittal, plus 7 days for each submittal of higher priority which is still under review, unless specified otherwise in these special provisions.

The initial working drawing schedule submittal, as specified herein, shall be considered a component of the Baseline Schedule provisions of Progress Schedule (Critical Path Method), and the monthly working drawing schedule update provisions, as specified herein, shall be considered a component of the provisions of Progress Schedule (Critical Path Method), and the deduction and retention provisions of Progress Schedule (Critical Path Method) shall apply.

Full compensation for preparing and submitting the working drawing submittal schedule including all revisions shall be considered as included in the contract lump sum price paid for Progress Schedule (Critical Path Method), and no additional compensation will be allowed therefor.

## **10-1.06 CONTRACTOR SUPPLIED BIOLOGIST**

### **GENERAL**

#### **Summary**

This work includes providing a minimum of two full-time Contractor supplied biologists to monitor construction and other activities to protect regulated species that may be harmed during construction activities.

#### **Submittals**

**Qualifications:** Within 7 days after contract approval, submit each biologist's name, resume, and statement of qualifications to the Engineer. Allow 10 days for the Engineer's review. If the submittal is incomplete, the Engineer will provide comments. Within 7 days after receiving the Engineer's comments, update and re-submit qualifications data. Do not start construction activities until the Contractor Supplied Biologists are authorized by the Engineer.

**Pre-Construction Survey Report:** Submit a Pre-Construction Survey Report within 14 days before beginning construction activities.

**Monitoring Report:** Submit a Monitoring Report every 5 working days during the monitoring period.

Monitoring Report: Submit Monitoring Reports according to the following schedules:

Species	Report Schedule
Migratory birds	Weekly

Incident Report: Submit an Incident Report within 24 hours of the incident.

#### **Qualifications:**

Biologists who perform specialized activities must have demonstrated field experience working with the species or performing the specialized task. Biologists who perform specialized activities must meet the following minimum requirements:

Specialized Activity / Species	Requirements
Bird monitoring, management, protection and reporting	Bachelor's degree in biology, or related field. Two years of relevant experience monitoring birds during construction.

### **CONSTRUCTION**

#### **Monitoring Schedule**

Monitoring must comply with the schedule in Species Protection.

#### **Monitoring Duties**

The biologist must:

- Monitor for regulated bird species within the project area.
- Assure that construction activities do not result in take of regulated species.
- Assure that construction activities comply with PLACs.
- Immediately notify the Engineer of any take of regulated species.
- Prepare, submit, and sign notifications and reports.

#### **Notification and Reporting**

All reports must include:

- Name(s) of the biologist(s) conducting biological activity
- Date(s) and time(s) of monitoring
- Locations and activities monitored
- Representative photographs
- Findings
- Reports must recommend actions to protect the regulated bird species
- Name of the biologist who prepared the report
- Signature of the biologist certifying the accuracy of the report

The Pre-Construction Survey Report includes:

- Detailed observations and locations where regulated bird species were observed

The incident report includes:

- Description of any take incident
- Species name and number taken
- Details of required notifications with contact information
- Corrective actions proposed or taken
- Disposition of taken species

### **MEASUREMENT AND PAYMENT**

The contract lump sum price paid for Contractor supplied Biologist includes full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in Contractor supplied

Biologist as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

## **10-1.07 WATER POLLUTION CONTROL**

### **GENERAL**

#### **Summary**

This work includes developing and implementing a storm water pollution prevention plan (SWPPP).

This project is risk level 2.

A storm water information handout has been prepared for this contract and is available as described in "Supplemental Project Information" of these special provisions.

Discharges of stormwater from the project must comply with National Pollutant Discharge Elimination System (NPDES) General Permit for Storm Water Discharges Associated with Construction and Land Disturbance Activities (Order No. 2009-0009-DWQ, NPDES No. CAS000002) referred to herein as "Permit."

Information on forms, reports, and other documents can be found in the following Department manuals:

1. Field Guide for Construction Site Dewatering
2. Storm Water Pollution Prevention Plan (SWPPP) and Water Pollution Control Program (WPCP) Preparation Manual
3. Construction Site Best Management Practices (BMP) Manual

For the above-referenced manuals, go to the Department's Web site for the Division of Construction, Storm Water and Water Pollution Control Information, or the Department's Publication Distribution Unit.

Do not start job site activities until:

1. The SWPPP is approved.
2. The waste discharge identification number is issued.
3. SWPPP review requirements have been fulfilled. If the Regional Water Quality Control Board (RWQCB) requires time for review, allow 30 days for the review. For projects in the Lake Tahoe Hydrologic Unit and the Mammoth Lakes Hydrologic Unit, the Lahontan RWQCB will review the SWPPP.

The following RWQCB will review the approved SWPPP:

1. San Francisco Bay RWQCB

If you operate a Contractor-support facility, protect stormwater systems and receiving waters from the discharge of potential pollutants by using water pollution control practices.

Contractor-support facilities include:

1. Staging areas
2. Storage yards for equipment and materials
3. Mobile operations
4. Batch plants for PCC and HMA
5. Crushing plants for rock and aggregate
6. Other facilities installed for your convenience, such as haul roads

Discharges from manufacturing facilities, such as batch plants and crushing plants, must comply with the general waste discharge requirements for Order No. 97-03-DWQ, NPDES General Permit No. CAS000001, issued by the State Water Resources Control Board (SWRCB) for "Discharge of Storm Water Associated with Industrial Activities Excluding Construction Activities" and referred to herein as "General Industrial Permit." For the General Industrial Permit, go to the Web site for the SWRCB.

If you operate a batch plant to manufacture PCC, HMA, or other material or a crushing plant to produce rock or aggregate, obtain coverage under the General Industrial Permit. You must be covered under the General Industrial Permit for batch plants and crushing plants located:

1. Outside of the job site
2. Within the job site that serve 1 or more contracts

If you obtain or dispose of material at a noncommercially operated borrow or disposal site, prevent water pollution due to erosion at the site during and after completion of your activities. Upon completion of your work, leave the site in a condition such that water will not collect or stand therein.

The Department does not pay for water pollution control practices at Contractor-support facilities and noncommercially operated borrow or disposal sites.

### **Definitions**

**active area:** Area where soil-disturbing work activities have occurred at least once within 15 days.

**construction phase:** Includes (1) highway construction phase for building roads and structures, (2) plant establishment and maintenance phase for placing vegetation for final stabilization, and (3) suspension phase for suspension of work activities or winter shutdown. The construction phase continues from the start of work activities to contract acceptance.

**inactive area:** Area where soil-disturbing work activities have not occurred within 15 days.

**normal working hours:** Hours you normally work on the project.

**qualifying rain event:** Storm that produces at least 12.7 millimeters of precipitation with a 48-hour or greater period between rain events.

**storm event:** Storm that produces or is forecasted to produce at least 2.54 millimeters of precipitation within a 24-hour period.

### **Submittals**

#### **Storm Water Pollution Prevention Plan**

##### **General**

Within 20 days of contract approval:

1. Submit 3 copies of your SWPPP for review. Allow 30 days for the Department's review. The Engineer provides comments and specifies the date when the review stopped if revisions are required.
2. Resubmit a revised SWPPP within 15 days of receiving the Engineer's comments. The Department's review resumes when a complete SWPPP has been resubmitted.
3. When the Engineer approves the SWPPP, submit an electronic copy and 4 printed copies of the approved SWPPP.
4. If the RWQCB requires review of the approved SWPPP, the Engineer submits the approved SWPPP to the RWQCB for its review and comment.
5. If the Engineer requests changes to the SWPPP based on the RWQCB's comments, amend the SWPPP within 10 days.

A qualified SWPPP developer (QSD) must develop the SWPPP.

The SWPPP must comply with the Department's Storm Water Pollution Prevention Plan (SWPPP) and Water Pollution Control Plan (WPCP) Preparation Manual. Include the following in the SWPPP:

1. Description of the work involved in the installation, maintenance, repair, and removal of temporary and permanent water pollution control practices.
2. Maps showing:
  - 2.1. Locations of disturbed soil areas
  - 2.2. Water bodies and conveyances
  - 2.3. Locations and types of water pollution control practices that will be used for each Contractor-support facility
  - 2.4. Locations and types of temporary water pollution control practices that will be used in the work for each construction phase
  - 2.5. Locations and types of water pollution control practices that will be installed permanently under the contract
  - 2.6. Pollutant sampling locations
  - 2.7. Locations planned for storage and use of potential nonvisible pollutants
  - 2.8. Receiving water sampling locations

3. Copy of permits obtained by the Department, including Fish & Game permits, US Army Corps of Engineers permits, RWQCB 401 certifications, aerially deposited lead variance from the Department of Toxic Substance Control, aerially deposited lead variance notification, and RWQCB waste discharge requirements for aerially deposited lead reuse.

Include the following items in the SWPPP:

1. For all projects:
  - 1.1. Schedule
  - 1.2. Construction site monitoring program (CSMP)
2. For risk level 2 projects add:
  - 2.1. Adherence to effluent standards for numeric action levels (NALs)
  - 2.2. Rain event action plan (REAP)
3. For risk level 3 projects add:
  - 3.1. Adherence to effluent standards for NALs and numeric effluent levels (NELs)
  - 3.2. REAP

#### **Schedule**

The SWPPP schedule must show when:

1. Work activities will be performed that could cause the discharge of pollutants into stormwater
2. Water pollution control practices associated with each construction phase will be implemented
3. Soil stabilization and sediment control practices for disturbed soil areas will be implemented

#### **Construction Site Monitoring Program**

A QSD must prepare the CSMP. Change the program to reflect current job site activities as needed. The CSMP must include the following:

1. For all projects:
  - 1.1. Visual monitoring procedures
  - 1.2. Sampling and analysis plan (SAP) for nonvisible pollutants
  - 1.3. SAP for nonstormwater discharges
  - 1.4. SAP for monitoring required by RWQCB
2. For risk level 2 projects add SAP for pH and turbidity
3. For risk level 3 projects add:
  - 3.1. SAP for pH and turbidity
  - 3.2. SAP for temporary active treatment systems

#### **Sampling and Analysis Plan**

Include a SAP in the CSMP.

Describe the following water quality sampling procedures in the SAP:

1. Sampling equipment
2. Sample preparation
3. Collection
4. Field measurement methods
5. Analytical methods
6. Quality assurance and quality control
7. Sample preservation and labeling
8. Collection documentation
9. Sample shipping

10. Chain of custody
11. Data management and reporting
12. Precautions from the construction site health and safety plan
13. Laboratory selection and certifications

The SAP must identify the State-certified laboratory, sample containers, preservation requirements, holding times, and analytical method. For a list of State-certified laboratories go to the CDPH Web site.

The SAP must include procedures for sample collection during precipitation.

The SAP must list conditions when you will not be required to physically collect samples such as:

1. Dangerous weather
2. Flooding or electrical storms
3. Times outside of normal working hours

Amend the SAP whenever discharges or sampling locations change because of changed work activities or knowledge of site conditions.

For a risk level 2 or risk level 3 project, include procedures in the SAP for collecting and analyzing at least 3 samples for each day of each qualifying rain event. Describe the collection of effluent samples at all locations where the stormwater is discharged off-site.

The SAP for nonvisible pollutants must describe the sampling and analysis strategy for monitoring nonvisible pollutants.

The SAP for nonvisible pollutants must identify potential nonvisible pollutants present at the job site associated with any of the following:

1. Construction materials and wastes
2. Existing contamination due to historical site usage
3. Application of soil amendments, including soil stabilization materials, with the potential to change pH or contribute toxic pollutants to stormwater

The SAP for nonvisible pollutants must include sampling procedures for the following conditions when observed during a stormwater visual inspection. Include a procedure for collecting at least 1 sample for each storm event for:

1. Materials or wastes containing potential nonvisible pollutants not stored under watertight conditions
2. Materials or wastes containing potential nonvisible pollutants stored under watertight conditions at locations where a breach, leak, malfunction, or spill occurred and was not cleaned up before the precipitation
3. Chemical applications occurring within 24 hours before precipitation or during precipitation that could discharge pollutants to surface waters or drainage systems, including fertilizer, pesticide, herbicide, methyl methacrylate concrete sealant, or nonpigmented curing compound
4. Applied soil amendments, including soil stabilization materials that could change pH levels or contribute toxic pollutants to stormwater runoff and discharge pollutants to surface waters or drainage systems, unless independent test data is available to indicate acceptable concentrations of nonvisible pollutants in the material
5. Stormwater runoff from an area contaminated by historical usage of the site that could discharge pollutants to surface waters or drainage systems

The SAP for nonvisible pollutants must provide sampling procedures and a schedule for:

1. Sample collection during the first 2 hours of rain events that generate runoff
2. Sample collection during normal working hours
3. Each nonvisible pollutant source
4. Uncontaminated control sample

The SAP for nonvisible pollutants must identify locations for sampling downstream and control samples and the reasons for selecting those locations. Select locations for control samples where the sample does not come in contact with materials, wastes, or areas associated with potential nonvisible pollutants or disturbed soil areas.

### **Amendments**

Amend and resubmit the SWPPP:

1. Annually before July 15th
2. Whenever:
  - 2.1. Changes in work activities could affect the discharge of pollutants
  - 2.2. Water pollution control practices are added by Contract Change Order
  - 2.3. Water pollution control practices are added at your discretion
  - 2.4. Changes in the quantity of disturbed soil are substantial
  - 2.5. Objectives for reducing or eliminating pollutants in stormwater discharges have not been achieved
  - 2.6. You receive a written notice of a permit violation for the project from the RWQCB or any other regulatory agency

Allow the same review time for amendments to the SWPPP as for the original SWPPP.

### **Training Records**

Submit water pollution control training records for all employees and subcontractors who will be working at the job site. Include the training subjects, training dates, ongoing training, and tailgate meetings with your submittal. Submit records for:

1. Existing employees within 5 working days of obtaining SWPPP approval
2. New employees within 5 working days of receiving the training
3. A subcontractor's employees at least 5 working days before the subcontractor starts work

### **Contractor-Support Facility**

At least 5 working days before operating any Contractor-support facility, submit:

1. A plan showing the location and quantity of water pollution control practices associated with the Contractor-support facility
2. A copy of the notice of intent approved by the RWQCB and the SWPPP approved by the RWQCB if you will be operating a batch plant or a crushing plant under the General Industrial Permit

### **Annual Certification**

Submit an annual certification of compliance as described in the Department's Storm Water Pollution Prevention Plan (SWPPP) and Water Pollution Control Plan (WPCP) Preparation Manual before July 15th of each year.

### **Site Inspection Reports**

The water pollution control (WPC) manager must submit the following within 24 hours of completing a weekly inspection:

1. Completed Stormwater Site Inspection Report form.
2. Best management practices (BMP) status report. The WPC manager must oversee the preparation of the report. The report must include:
  - 2.1. Location and quantity of installed water pollution control practices
  - 2.2. Location and quantity of disturbed soil for active and inactive areas

### **Visual Monitoring Reports**

Submit a visual monitoring report for:

1. Each storm event. Include:
  - 1.1. Date, time, and rain gauge reading
  - 1.2. Visual observations:

1.2.1. Within 2 working days before the storm for:

- 1.2.1.1. Spills, leaks, and uncontrolled pollutants in drainage areas
- 1.2.1.2. Proper implementation of water pollution control practices
- 1.2.1.3. Leaks and adequate freeboard in storage areas

1.2.2. Every 24 hours during the storm for:

- 1.2.2.1. Effective operation of water pollution control practices
- 1.2.2.2. Water pollution control practices needing maintenance and repair

1.2.3. Within 2 working days after a qualifying rain event for:

- 1.2.3.1. Stormwater discharge locations
- 1.2.3.2. Evaluation of design, implementation, effectiveness, and locations of water pollution control practices including locations where additional water pollution control practices may be needed

2. Nonstormwater discharges during each of the following periods:

- 2.1. January through March
- 2.2. April through June
- 2.3. July through September
- 2.4. October through December

Use the Stormwater Site Inspection Report form to document visual monitoring. A visual monitoring report must include:

- 1. Name of personnel performing the inspection, inspection date, and date the inspection report is completed
- 2. Storm and weather conditions
- 3. Location of any:
  - 3.1. Floating and suspended material, sheen on the surface, discoloration, turbidity, odor, and source of observed pollutants for flowing and contained stormwater systems
  - 3.2. Nonstormwater discharges and their sources
- 4. Corrective action taken

Retain visual monitoring reports at the job site as part of the SWPPP.

### **Sampling and Analysis**

Whenever sampling is required, submit a printed copy and electronic copy of water quality analysis results, and quality assurance and quality control reports within 48 hours of field sampling, and within 30 days of laboratory analysis. Electronic copies must be in one of the following formats: (1) xls, (2) .txt, (3) .cvs, (4) .dbs, or (5) .mdb. Include an evaluation of whether the downstream samples show levels of the tested parameter that are higher than the control sample. The evaluation must include:

- 1. Sample identification number
- 2. Contract number
- 3. Constituent
- 4. Reported value
- 5. Analytical method
- 6. Method detection limit
- 7. Reported limit



### **Numeric Action Level Exceedance Reports**

Whenever a NAL is exceeded for a risk level 2 or risk level 3 project, notify the Engineer and submit a NAL exceedance report within 48 hours after conclusion of a storm event. The report must include:

1. Field sampling results and inspections, including:
  - 1.1. Analytical methods, reporting units, and detection limits
  - 1.2. Date, location, time of sampling, visual observations, and measurements
  - 1.3. Quantity of precipitation from the storm event
2. Description of BMP and corrective actions taken to manage NAL exceedance

### **Numeric Effluent Limit Violation Reports**

Whenever a NEL is exceeded for a risk level 3 project, notify the Engineer and submit a NEL violation report within 6 hours. The report must include:

1. Field sampling results and inspections, including:
  - 1.1. Analytical methods, reporting units, and detection limits
  - 1.2. Date, location, time of sampling, visual observation and measurements
  - 1.3. Quantity of precipitation from the storm event
2. Description of BMP and corrective actions taken to manage NEL exceedance

### **Rain Event Action Plan**

For a risk level 2 or risk level 3 project, submit a REAP whenever the National Weather Service is predicting a storm event with at least 50 percent probability of precipitation within 72 hours.

The WPC manager must submit the REAP at least 48 hours before a forecasted storm event.

The REAP must include:

1. Site location
2. Project risk level
3. Contact information including 24-hour emergency phone numbers for:
  - 3.1. WPC manager
  - 3.2. Erosion and sediment control providers or subcontractors
  - 3.3. Stormwater sampling providers or subcontractors
4. Storm information
5. Description of:
  - 5.1. Construction phase, including active and inactive areas
  - 5.2. Active work areas and activities
  - 5.3. Subcontractors and trades on the job site
  - 5.4. Prestorm activities including:
    - 5.4.1. Responsibilities of the WPC manager
    - 5.4.2. Responsibilities of the crew and crew size
    - 5.4.3. Stabilization practices for active and inactive disturbed soil areas
    - 5.4.4. Stockpile management practices
    - 5.4.5. Corrective actions taken for deficiencies identified during prestorm visual inspections
  - 5.5. Activities to be performed during storm events, including:
    - 5.5.1. Responsibilities of the WPC manager
    - 5.5.2. Responsibilities of the crew and crew size
    - 5.5.3. BMP for maintenance and repair

## 6. Flood contingency measures

### **Storm Water Annual Report**

Submit 2 copies of a storm water annual report that covers the preceeding period from July 1st to June 30th. The report must be submitted before July 15th if construction occurs from July 1st to June 30th or within 15 days after contract acceptance if construction ends before June 30th. Allow 10 days for the Engineer's review. The Engineer provides comments and specifies the date when the review stopped if revisions are required.

Obtain approval for the format of the storm water annual report. The report must include:

1. Project information such as description and work locations
2. Stormwater monitoring information, including:
  - 2.1. Summary and evaluation of sampling and analysis results and laboratory reports
  - 2.2. Analytical methods, reporting units, and detections limits for analytical parameters
  - 2.3. Summary of corrective actions taken
  - 2.4. Identification of corrective actions taken and compliance activities not implemented
  - 2.5. Summary of violations
  - 2.6. Names of individuals performing stormwater inspections and sampling
  - 2.7. Logistical information for inspections and sampling, including location, date, time, and precipitation
  - 2.8. Visual observations and sample collection records
3. Documentation of training for individuals responsible for:
  - 3.1. Permit compliance
  - 3.2. BMP installation, inspection, maintenance, and repair
  - 3.3. Preparing, revising, and amending the SWPPP
  - 3.4. Material Containment, Collection and Handling Program (MCCHP)

Submit a revised storm water annual report within 5 working days of receiving the Engineer's comments. The Engineer's review resumes when a complete report has been resubmitted.

When the storm water annual report is approved, submit 1 electronic copy and 2 printed copies of the report signed by the WPC manager.

### **Information After Storm Event**

Within 48 hours after the conclusion of a storm event resulting in a discharge, after a nonstormwater discharge, or after receiving a written notice or an order from the RWQCB or another regulatory agency, the WPC manager must submit the following information:

1. Date, time, location, and nature of the activity and the cause of the notice or order
2. Type and quantity of discharge
3. Water pollution control practices in use before the discharge or before receiving the notice or order
4. Description of water pollution control practices and corrective actions taken to manage the discharge or cause of the notice

### **Quality Control and Assurance**

#### **Training**

Employees must receive initial water pollution control training before starting work at the job site.

For your project managers, supervisory personnel, subcontractors, and employees involved in water pollution control work:

1. Provide stormwater training in the following subjects:
  - 1.1. Water pollution control rules and regulations
  - 1.2. Implementation and maintenance for:
    - 1.2.1. Temporary soil stabilization
    - 1.2.2. Temporary sediment control
    - 1.2.3. Tracking control

- 1.2.4. Wind erosion control
- 1.2.5. Material pollution prevention and control
- 1.2.6. Waste management
- 1.2.7. Nonstormwater management

### 1.3. Material Containment, Collection and Handling Program (MCCHP)

- 2. Conduct weekly training meetings covering:
  - 2.1. Deficiencies and corrective actions for water pollution control practices
  - 2.2. Water pollution control practices required for work activities during the week
  - 2.3. Spill prevention and control
  - 2.4. Material delivery, storage, usage, and disposal
  - 2.5. Waste management
  - 2.6. Nonstormwater management procedures

Training for personnel who collect water quality samples must include:

- 1. CSMP review
- 2. Health and safety review
- 3. Sampling simulations

## **Water Pollution Control Manager**

### **General**

The WPC manager must be a QSD. Assign 1 WPC manager to implement the SWPPP. You may assign a QSD other than the WPC manager to develop the SWPPP.

### **Qualifications**

A QSD must:

- 1. Have completed stormwater management training described in the Department's Web site for the Division of Construction, Storm Water and Water Pollution Control Information
- 2. Be one or more of the following:
  - 2.1. California registered civil engineer
  - 2.2. California registered professional geologist or engineering geologist
  - 2.3. California licensed landscape architect
  - 2.4. Professional hydrologist registered through the American Institute of Hydrology
  - 2.5. Certified Professional in Erosion and Sediment Control (CPESC)<sup>TM</sup> registered through Enviro Cert International, Inc.
  - 2.6. Certified Professional in Storm Water Quality (CPSWQ)<sup>TM</sup> registered through Enviro Cert International, Inc.
  - 2.7. Professional in erosion and sediment control registered through the National Institute for Certification in Engineering Technologies (NICET)
- 3. Have completed SWRCB approved QSD training and passed the QSD exam

### **Responsibilities**

The WPC manager must:

- 1. Be responsible for water pollution control work
- 2. Be the primary contact for water pollution control work
- 3. Oversee:
  - 3.1. Maintenance of water pollution control practices
  - 3.2. Inspections of water pollution control practices identified in the SWPPP
  - 3.3. Inspections and reports for visual monitoring
  - 3.4. Preparation and implementation of REAPs
  - 3.5. Sampling and analysis

3.6. Preparation and submittal of:

- 3.6.1. NAL exceedance reports
  - 3.6.2. NEL violation reports
  - 3.6.3. SWPPP annual certification
  - 3.6.4. Annual reports
  - 3.6.5. BMP status reports
- 4. Oversee and enforce hazardous waste management practices including spill prevention and control measures
  - 5. Have authority to mobilize crews to make immediate repairs to water pollution control practices
  - 6. Ensure that all employees have current water pollution control training
  - 7. Implement the approved SWPPP
  - 8. Amend the SWPPP if required
  - 9. Be at the job site within 2 hours of being contacted
  - 10. Have the authority to stop construction activities damaging water pollution control practices or causing water pollution

**Sampling and Analysis**

Assign trained personnel to collect water quality samples. Document the personnel and training in the SAP.

Samples taken by assigned field personnel must comply with the equipment manufacturer's instructions for collection, analytical methods, and equipment calibration.

Samples taken for laboratory analysis must comply with water quality sampling procedures and be analyzed by a State-certified laboratory under 40 CFR part 136, Guidelines Establishing Test Procedures for the Analysis of Pollutants.

Whenever downstream samples show increased levels of pollutants, assess water pollution control practices, site conditions, and surrounding influences to determine the probable cause for the increase.

For a risk level 2 or risk level 3 project, obtain samples of pH and turbidity by the test methods shown in the following table:

Parameter	Test method	Detection limit (min)	Unit
pH	Field test with calibrated portable instrument	0.2	pH units
Turbidity	Field test with calibrated portable instrument	1	NTU

Whenever the turbidity NEL is exceeded for a risk level 3 project, obtain samples and analyze the suspended sediment concentration by the test method shown in the following table:

Parameter	Test method	Detection limit (min)	Unit
Suspended sediment concentration	ASTM D 3977	5	Mg/L

For a risk level 3 project, obtain samples of pH and turbidity from representative and accessible locations upstream of the discharge point and downstream of the discharge point.

For multiple discharge points, obtain samples from a single upstream and a single downstream location.

### Numeric Action Levels

For a risk level 2 or risk level 3 project, NALs must comply with the values shown in the following table:

Numeric Action Levels				
Parameter	Test method	Detection limit (min)	Unit	Value
pH	Field test with calibrated portable instrument	0.2	pH	Lower NAL = 6.5 Upper NAL = 8.5
Turbidity	Field test with calibrated portable instrument	1	NTU	250 NTU max

The storm event daily average must not exceed the NAL for pH.

The storm event daily average must not exceed the NAL for turbidity.

### Numeric Effluent Limits

For a risk level 3 project, NELs must comply with the values shown in the following table:

Numeric Effluent Limits				
Parameter	Test method	Detection limit (min)	Unit	Value
pH	Field test with calibrated portable instrument	0.2	pH	Lower NEL = 6.0 Upper NEL = 9.0
Turbidity	Field test with calibrated portable instrument	1	NTU	500 NTU max

The storm event daily average for storms up to the 5-year, 24-hour storm must not exceed the NEL for turbidity.

The daily average sampling results must not exceed the NEL for pH.

## MATERIALS

Not Used

## CONSTRUCTION

### General

Manage work activities to reduce the discharge of pollutants to surface waters, groundwater, and municipal separate storm sewer systems.

Retain a printed copy of the approved SWPPP at the job site.

Install facilities and devices used for water pollution control practices before performing work activities. Install soil stabilization materials for water pollution control practices in all inactive areas or before storm events.

Repair or replace water pollution control practices within 24 hours of discovering any damage, unless a longer period is authorized.

The Department does not pay for the cleanup, repair, removal, disposal, or replacement of water pollution control practices due to improper installation or your negligence.

You may request changes to the water pollution control work or the Engineer may order changes to water pollution control work. Changes may include additional or new water pollution control practices. Additional water pollution control work is paid for as extra work under Section 4-1.03D, "Extra Work," of the Standard Specifications.

You may request or the Engineer may order laboratory analysis of stormwater samples. If ordered, laboratory analysis of stormwater samples is paid for as extra work under Section 4-1.03D, "Extra Work," of the Standard Specifications.

Continue SWPPP implementation during any suspension of work activities.

### **Monitoring**

Monitor the National Weather Service's forecast on a daily basis. For the National Weather Service's forecast, go to the Web site for the National Weather Service.

Obtain, install, and maintain a rain gauge at the job site. Observe and record daily precipitation.

### **Inspections**

Use the Stormwater Site Inspection Report form for documenting site inspections.

The WPC manager must oversee:

1. Inspections of water pollution control practices identified in SWPPP:
  - 1.1. Before a forecasted storm event
  - 1.2. After a qualifying rain event that produces site runoff
  - 1.3. At 24-hour intervals during extended storm events
  - 1.4. On a predetermined schedule of at least once a week
2. Daily inspections of:
  - 2.1. Storage areas for hazardous materials and waste
  - 2.2. Hazardous waste disposal and transporting activities
  - 2.3. Hazardous material delivery and storage activities
3. Inspections of:
  - 3.1. Vehicle and equipment cleaning facilities:
    - 3.1.1. Daily if vehicle and equipment cleaning occurs daily
    - 3.1.2. Weekly if vehicle and equipment cleaning does not occur daily
  - 3.2. Vehicle and equipment maintenance and fueling areas:
    - 3.2.1. Daily if vehicle and equipment maintenance and fueling occurs daily
    - 3.2.2. Weekly if vehicle and equipment maintenance and fueling does not occur daily
  - 3.3. Vehicles and equipment at the job site for leaks and spills on a daily schedule. Verify that operators are inspecting vehicles and equipment each day of use.
  - 3.4. Demolition sites within 15.24 meters of storm drain systems and receiving waters daily.
  - 3.5. Pile driving areas for leaks and spills:
    - 3.5.1. Daily if pile driving occurs daily
    - 3.5.2. Weekly if pile driving does not occur daily
  - 3.6. Temporary concrete washouts:
    - 3.6.1. Daily if concrete work occurs daily
    - 3.6.2. Weekly if concrete work does not occur daily
  - 3.7. Paved roads at job site access points for street sweeping:
    - 3.7.1. Daily if earthwork and other sediment or debris-generating activities occur daily
    - 3.7.2. Weekly if earthwork and other sediment or debris-generating activities do not occur daily
    - 3.7.3. Within 24 hours of precipitation forecasted by the National Weather Service

3.8. Dewatering work:

- 3.8.1. Daily if dewatering work occurs daily
- 3.8.2. Weekly if dewatering work does not occur daily

3.9. Temporary active treatment system:

- 3.9.1. Daily if temporary active treatment system activities occur daily
- 3.9.2. Weekly if temporary active treatment system activities do not occur daily

3.10. Work over water:

- 3.10.1. Daily if work over water occurs daily
- 3.10.2. Weekly if work over water does not occur daily

**Deficiencies**

Whenever you or the Engineer identify a deficiency in the implementation of the approved SWPPP, correct the deficiency:

- 1. Immediately, unless a later date is authorized
- 2. Before precipitation occurs

The Department may correct the deficiency and deduct the cost of correcting the deficiency from payment if you fail to correct the deficiency by the agreed date or before the onset of precipitation.

**Rain Event Action Plan**

For a risk level 2 or risk level 3 project, have the REAP at the job site at least 24 hours before a forecasted storm event. The WPC manager must submit the REAP on the following forms:

- 1. Rain Event Action Plan Highway Construction Phase
- 2. Rain Event Action Plan Plant Establishment Phase
- 3. Rain Event Action Plan For Inactive Project

Retain a printed copy of each REAP at the job site as part of the SWPPP.

Implement the REAP, including mobilizing crews to complete activities, within 24 hours before precipitation occurs.

**Sampling and Analysis**

Perform sample collection during:

- 1. Normal working hours
- 2. Each qualifying rain event
- 3. First 2 hours of each storm event

Do not physically collect samples during dangerous weather conditions, such as flooding or electrical storms.

Document sample collection during precipitation.

Whenever downstream samples show increased levels of pH, turbidity, and other constituents, assess water pollution control practices, site conditions, and surrounding influences to determine the probable cause for the increase.

Collect samples:

- 1. During a storm event for:
  - 1.1. Each nonvisible pollutant source and a corresponding uncontaminated control sample
  - 1.2. All locations identified on the Storm Event Sampling and Analyses Plan form

2. During a qualifying rain event for:

- 2.1. Each nonvisible pollutant source and a corresponding uncontaminated control sample
- 2.2. pH, turbidity, and other constituents as required
- 2.3. At least 3 samples for each day of a qualifying rain event
- 2.4. All locations identified on the Qualifying Rain Event Sampling and Analyses Plan form

Collect receiving-water samples for a risk level 3 project and whenever a direct discharge to receiving waters occurs and NELs are violated.

Retain documentation of water quality sampling and analysis results with the SWPPP at the job site.

The Department does not pay for the preparation, collection, laboratory analysis, and reporting of stormwater samples for nonvisible pollutants if water pollution control practices are not implemented before precipitation or if you fail to correct a water pollution control practice before precipitation.

## **MEASUREMENT AND PAYMENT**

The contract lump sum price paid for prepare storm water pollution prevention plan includes full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in developing and implementing a SWPPP, including providing a WPC manager, conducting water pollution control training, and monitoring, inspecting and correcting water pollution control practices at the job site, as shown on the plans, as specified in the Standard Specifications and these special provisions, and directed by the Engineer.

For projects with 60 working days or less, the Department pays you for prepare stormwater pollution prevention plan as follows:

1. A total of 75 percent of the item total upon approval of the SWPPP
2. A total of 100 percent of the item total upon contract acceptance

For projects with more than 60 working days, the Department pays you for prepare stormwater pollution prevention plan as follows:

1. A total of 50 percent of the item total upon approval of the SWPPP
2. A total of 90 percent of the item total over the life of the contract
3. A total of 100 percent of the item total upon contract acceptance

If risk level 2 or 3, the Department pays \$500 for each rain event action plan submitted. The contract unit price paid for rain event action plan includes full compensation for furnishing all labor, materials, tools, equipment, and incidentals and for doing all the work involved in preparing REAPs, including preparing and submitting REAP forms, and monitoring weather forecasts, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

The Department does not adjust payment for an increase or decrease in the quantity of rain event action plan. Section 4-1.03B, "Increased or Decreased Quantities," of the Standard Specifications does not apply.

The Department pays \$2,000 for each storm water annual report submitted. The contract unit price paid for storm water annual report includes full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in preparing and submitting storm water annual reports, including annual certifications, monitoring reports, inspection, and sampling results, and obtaining acceptance of storm water annual reports, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

The Department does not adjust payment for an increase or decrease in the quantity of storm water annual report. Section 4-1.03B, "Increased or Decreased Quantities," of the Standard Specifications does not apply.

The work to complete the final storm water annual report contract item is excluded from Section 7-1.17, "Acceptance of Contract," of the Standard Specifications.

If risk level 2 or 3, the contract unit price paid for storm water sampling and analysis day includes full compensation for furnishing all labor, materials, tools, equipment, and incidentals and for doing all the work involved in reporting on stormwater quality per storm events and qualifying rain events, including preparation, collection, analysis of stormwater samples for pH, turbidity, and other constituents, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer. A single day of sampling is counted as 1 unit.

The Department does not adjust payment for an increase or decrease in the quantity of storm water sampling and analysis day. Section 4-1.03B, "Increased or Decreased Quantities," of the Standard Specifications does not apply.



The Department does not pay for the preparation, collection, laboratory analysis, and reporting of stormwater samples for nonvisible pollutants if water pollution control practices are not implemented before precipitation or if you fail to correct a water pollution control practice before precipitation.

For each failure to submit a completed storm water annual report, the Department withholds \$10,000. This withhold is in addition to other withholds under Section 9-1.07E(3) "Performance Failure Withholds," of the Standard Specifications.

Each failure to comply with any part of these special provisions and each failure to implement water pollution control practices are considered separate performance failures.

## **10-1.08 CONSTRUCTION SITE MANAGEMENT**

### **GENERAL**

#### **Summary**

This work includes preventing and controlling spills, dewatering, and managing materials, waste, and nonstormwater.

Implement effective handling, storage, usage, and disposal practices to control material pollution and manage waste and nonstormwater at the job site before they come in contact with storm drain systems and receiving waters.

The following abbreviations are used in this special provision:

DTSC: Department of Toxic Substance Control.

ELAP: Environmental Laboratory Accreditation Program.

MCCHP: Material Containment, Collection and Handling Program

WPC: Water Pollution Control.

#### **Submittals**

Before you start dewatering, submit a dewatering and discharge work plan under "Working Drawings," and "Water Pollution Control" of these special provisions. The dewatering and discharge work plan must include:

1. Title sheet and table of contents
2. Description of dewatering and discharge activities detailing locations, quantity of water, equipment, and discharge point
3. Estimated schedule for dewatering and discharge start and end dates of intermittent and continuous activities
4. Discharge alternatives, such as dust control or percolation
5. Visual monitoring procedures with inspection log
6. Copy of written approval to discharge into a sanitary sewer system at least 5 working days before starting discharge activities

Submit the following:

1. Material Safety Data Sheet at least 5 working days before material is used or stored
2. Monthly inventory records for material used or stored

Submit written approval from the local health agency, city, county, and sewer district before discharging from a sanitary or septic system directly into a sanitary sewer system.

### **MATERIALS**

Not Used

### **CONSTRUCTION**

#### **Spill Prevention and Control**

##### **General**

Keep material or waste storage areas clean, well organized, and equipped with enough cleanup supplies for the material being stored.

Implement spill and leak prevention procedures for chemicals and hazardous substances stored on the job site. Whenever you spill or leak chemicals or hazardous substances at the job site, you are responsible for all associated cleanup costs and related liability.

Report minor, semi-significant, and significant or hazardous spills to the WPC manager. The WPC manager must notify the Engineer immediately.

As soon as it is safe, contain and clean up spills of petroleum materials and sanitary and septic waste substances listed under 40 CFR, Parts 110, 117, and 302.

### **Minor Spills**

Minor spills consist of quantities of oil, gasoline, paint, or other materials that are small enough to be controlled by a 1st responder upon discovery of the spill.

Clean up a minor spill using the following procedures:

1. Contain the spread of the spill
2. Recover the spilled material using absorption
3. Clean the contaminated area
4. Dispose of the contaminated material and absorbents promptly and properly under "Waste Management" of these special provisions

### **Semi-Significant Spills**

Semi-significant spills consist of spills that can be controlled by a 1st responder with help from other personnel.

Clean up a semi-significant spill immediately using the following procedures:

1. Contain the spread of the spill.
2. On paved or impervious surfaces, encircle and recover the spilled material with absorbent materials. Do not allow the spill to spread widely.
3. If the spill occurs on soil, contain the spill by constructing an earthen dike and dig up the contaminated soil for disposal.
4. If the spill occurs during precipitation, cover the spill with 10-mil plastic sheeting or other material to prevent contamination of runoff.
5. Dispose of the contaminated material promptly and properly under "Waste Management" of these special provisions.

### **Significant or Hazardous Spills**

Significant or hazardous spills consist of spills that cannot be controlled by job site personnel.

Immediately notify qualified personnel of a significant or hazardous spill. Take the following steps:

1. Do not attempt to clean up the spill until qualified personnel have arrived
2. Notify the Engineer and follow up with a report
3. Obtain the immediate services of a spill contractor or hazardous material team
4. Notify local emergency response teams by dialing 911 and county officials by using the emergency phone numbers retained at the job site
5. Notify the California Emergency Management Agency State Warning Center at (916) 845-8911
6. Notify the National Response Center at (800) 424-8802 regarding spills of Federal reportable quantities under 40 CFR 110, 119, and 302
7. Notify other agencies as appropriate, including:
  - 7.1. Fire Department
  - 7.2. Public Works Department
  - 7.3. Coast Guard
  - 7.4. Highway Patrol
  - 7.5. City Police or County Sheriff's Department
  - 7.6. Department of Toxic Substances
  - 7.7. California Division of Oil and Gas
  - 7.8. Cal/OSHA
  - 7.9. Regional Water Resources Control Board

Prevent a spill from entering stormwater runoff before and during cleanup activities. Do not bury or wash the spill with water.

### **Material Management**

The storage of any chemical or petroleum products on the closed bridge structure is prohibited. Minimize or eliminate discharge of material into the air, storm drain systems, and receiving waters while taking delivery of, using, or storing the following materials:

1. Hazardous chemicals, including acids, lime, glues, adhesives, paints, solvents, and curing compounds
2. Soil stabilizers and binders
3. Fertilizers
4. Detergents
5. Plaster
6. Petroleum materials, including fuel, oil, and grease
7. Asphalt and concrete components
8. Pesticides and herbicides

Employees trained in emergency spill cleanup procedures must be present during the unloading of hazardous materials or chemicals.

Use less hazardous materials if practicable.

The following activities must be performed at least 30.48 meters from concentrated flows of stormwater, drainage courses, and inlets if within the floodplain and at least 15.24 meters if outside the floodplain, unless otherwise approved by the Engineer:

1. Stockpiling materials
2. Storing pile-driving equipment and liquid waste containers
3. Washing vehicles and equipment in outside areas
4. Fueling and maintaining vehicles and equipment

### **Material Storage**

If materials are stored:

1. Store liquids, petroleum materials, and substances listed in 40 CFR 110, 117, and 302 and place them in secondary containment facilities as specified by US DOT for storage of hazardous materials.
2. Secondary containment facilities must be impervious to the materials stored there for a minimum contact time of 72 hours.
3. Cover secondary containment facilities during non-working days and whenever precipitation is forecasted. Secondary containment facilities must be adequately ventilated.
4. Keep secondary containment facilities free of accumulated rainwater or spills. After precipitation, or in the event of spills or leaks, collect accumulated liquid and place it into drums within 24 hours. Handle the liquid as hazardous waste under "Waste Management" of these special provisions unless testing confirms that the liquid is nonhazardous.
5. Do not store incompatible materials, such as chlorine and ammonia, in the same secondary containment facility.
6. Store materials in their original containers with the original material labels maintained in legible condition. Immediately replace damaged or illegible labels.
7. Secondary containment facilities must have the capacity to contain precipitation from a 24-hour-long, 25-year storm, plus 10 percent of the aggregate volume of all containers or the entire volume of the largest container within the facility, whichever is greater.
8. Store bagged or boxed material on pallets. Protect bagged or boxed material from wind and rain during non-working days and whenever precipitation is forecasted.
9. Provide sufficient separation between stored containers to allow for spill cleanup or emergency response access. Storage areas must be kept clean, well organized, and equipped with cleanup supplies appropriate for the materials being stored.
10. Repair or replace perimeter controls, containment structures, covers, and liners as necessary. Inspect storage areas before and after precipitation and at least weekly during other times.

### **Stockpile Management**

The storage of any dismantled bridge material or debris on the bridge is prohibited and must be removed by the end of each working shift. Minimize stockpiling of materials within other areas of the job site.

Implement water pollution control practices within 72 hours of stockpiling material or before a forecasted storm event, whichever occurs first. If stockpiles are being used, do not allow soil, sediment, or other debris to enter storm drains, open drainages, and watercourses.

Active and inactive soil stockpiles must be:

1. Covered with soil stabilization material or a temporary cover
2. Surrounded with a linear sediment barrier

Stockpiles of asphalt concrete and PCC rubble, HMA, aggregate base, or aggregate subbase must be:

1. Covered with a temporary cover
2. Surrounded with a linear sediment barrier

Stockpiles of pressure-treated wood must be:

1. Placed on pallets
2. Covered with impermeable material

Stockpiles of cold mix asphalt concrete must be:

1. Placed on an impervious surface
2. Covered with an impermeable material
3. Protected from stormwater run-on and runoff

Control wind erosion year round under Section 14-9.02, "Dust Control," of the Standard Specifications.

Repair or replace linear sediment barriers and covers as needed to keep them functioning properly. Whenever sediment accumulates to 1/3 of the linear sediment barrier height, remove the accumulated sediment.

## **Waste Management**

### **Solid Waste**

Do not allow litter, trash, or debris to accumulate anywhere on the job site, including storm drain grates, trash racks, and ditch lines. Pick up and remove litter, trash, and debris from the job site daily on the bridge structure and at least once a week at other locations. The WPC manager must monitor solid waste storage and disposal procedures on the job site.

If practicable, recycle nonhazardous job site waste and excess material. If recycling is not practicable, dispose of it under Section 7-1.13, "Disposal of Materials Outside the Highway Right of Way," of the Standard Specifications.

Furnish enough closed-lid dumpsters of sufficient size to contain the solid waste generated by work activities. When refuse reaches the fill line, empty the dumpsters. Dumpsters must be watertight. Do not wash out dumpsters at the job site. Furnish additional containers and pick up dumpsters more frequently during the demolition phase of construction.

Solid waste includes:

1. Brick
2. Mortar
3. Timber
4. Metal scraps
5. Sawdust
6. Pipe
7. Electrical cuttings
8. Nonhazardous equipment parts
9. Styrofoam and other packaging materials
10. Vegetative material and plant containers from highway planting
11. Litter and smoking material, including litter generated randomly by the public
12. Other trash and debris

Furnish and use trash receptacles in the job site yard, field trailers, and locations where workers gather for lunch and breaks.

### **Hazardous Waste and Contamination**

If hazardous waste is, or will be, generated on the job site, the WPC manager must be thoroughly familiar with proper hazardous waste handling and emergency procedures under 40 CFR § 262.34(d)(5)(iii) and must have successfully completed training under 22 CA Code of Regs § 66265.16.

The WPC manager must:

1. Oversee and enforce hazardous waste management practices
2. Inspect all hazardous waste storage areas daily, including all temporary containment facilities and satellite collection locations
3. Oversee all hazardous waste transportation activities on the job site

Submit a copy of uniform hazardous waste manifest forms to the Engineer within 24 hours of transporting hazardous waste.

Submit receiving landfill documentation of proper disposal to the Engineer within 5 working days of hazardous waste transport from the project.

### **Unanticipated Discovery of Asbestos and Hazardous Substances**

Upon discovery of asbestos or a hazardous substance, comply with Section 7-1.01L, "Asbestos and Hazardous Substances," of the Standard Specifications.

### **Hazardous Waste Management Practices**

Handle, store, and dispose of hazardous waste under 22 CA Code of Regs Div 4.5.

Use the following storage procedures:

1. Store hazardous waste and potentially hazardous waste separately from nonhazardous waste at the job site.
2. For hazardous waste storage, use metal containers approved by the United States Department of Transportation for the transportation and temporary storage of hazardous waste.
3. Store hazardous waste in sealed, covered containers labeled with the contents and accumulation start date under 22 CA Code of Regs, Div 4.5. Labels must comply with the provisions of 22 CA Code of Regs, Div 4.5. § 66262.31 and § 66262.32. Immediately replace damaged or illegible labels.
4. Handle hazardous waste containers such that no spillage occurs.
5. Store hazardous waste away from storm drains, watercourses, moving vehicles, and equipment.
6. Furnish containers with adequate storage volume at convenient satellite locations for hazardous waste collection. Immediately move these containers to secure temporary containment facilities when no longer needed at the collection location or when full.
7. Store hazardous waste and potentially hazardous waste in secure temporary containment enclosures having secondary containment facilities impervious to the materials stored there for a minimum contact-time of 72 hours. Temporary containment enclosures must be located away from public access. Acceptable secure enclosures include a locked chain link fenced area or a lockable shipping container located within the project limits.
8. Design and construct secondary containment facilities with a capacity to contain precipitation from a 24-hour-long, 25-year storm; and 10 percent of the aggregate volume of all containers, or the entire volume of the largest container within the facility, whichever is greater.
9. Cover secondary containment facilities during non-working days and if a storm event is predicted. Secondary containment facilities must be adequately ventilated.
10. Keep secondary containment facility free of accumulated rainwater or spills. After a storm event, or in the event of spills or leaks, collect accumulated liquid and place into drums within 24 hours. Handle these liquids as hazardous waste unless testing determines them to be nonhazardous.
11. Do not store incompatible wastes, such as chlorine and ammonia, in the same secondary containment facility.
12. Provide sufficient separation between stored containers to allow for spill cleanup or emergency response access. Storage areas must be kept clean, well organized, and equipped with cleanup supplies appropriate for the wastes being stored.
13. Repair or replace perimeter controls, containment structures, covers, and liners as necessary. Inspect storage areas before and after a storm event, and at least weekly during other times.

Do not:

1. Overfill hazardous waste containers
2. Spill hazardous waste or potentially hazardous waste
3. Mix hazardous wastes
4. Allow hazardous waste or potentially hazardous waste to accumulate on the ground

Dispose of hazardous waste within 90 days of the start of generation. Use a hazardous waste manifest and a transporter registered with the DTSC and in compliance with the CA Highway Patrol Biennial Inspection of Terminals Program to transport hazardous waste to an appropriately permitted hazardous waste management facility.

#### **Dust Control for Hazardous Waste or Contamination**

Excavation, transportation, and handling of material containing hazardous waste or contamination must result in no visible dust migration. Have a water truck or tank on the job site at all times while clearing and grubbing and performing earthwork operations in work areas containing hazardous waste or contamination.

#### **Stockpiling of Hazardous Waste or Contamination**

Do not stockpile material containing hazardous waste or contamination unless ordered. Stockpiles of material containing hazardous waste or contamination must not be placed where affected by surface run-on or run-off. Cover stockpiles with 13 mils minimum thickness of plastic sheeting or 1 foot of nonhazardous material. Do not place stockpiles in environmentally sensitive areas. Stockpiled material must not enter storm drains, inlets, or waters of the State.

#### **Contractor-Generated Hazardous Waste**

You are the generator of hazardous waste generated as a result of materials you bring to the job site. Use hazardous waste management practices if you generate waste on the job site from the following substances:

1. Petroleum materials
2. Asphalt materials
3. Concrete curing compound
4. Pesticides
5. Acids
6. Paints
7. Stains
8. Solvents
9. Wood preservatives
10. Roofing tar
11. Road flares
12. Lime
13. Glues and adhesives
14. Materials classified as hazardous waste under 22 CA Code of Regs, Div 4.5

If hazardous waste constituent concentrations are unknown, use a laboratory certified by the ELAP under the California Department Of Public Health to analyze a minimum of 4 discrete representative samples of the waste to determine whether it is a hazardous waste and to determine safe and lawful methods for storage and disposal. Perform sampling and analysis in compliance with US EPA Test Methods for Evaluating Solid Waste, Physical/Chemical Methods (SW-846) and under 22 CA Code of Regs, Div 4.5.

Use your US EPA Generator Identification Number and sign hazardous waste manifests for the hazardous waste you generate.

Identify contaminated soil resulting from spills or leaks by noticing discoloration, or differences in soil properties. Immediately notify the Engineer of spills or leaks. Clean up spills and leaks under the Engineer's direction and to the satisfaction of the Engineer. Soil with evidence of contamination must be sampled and analysis performed by a laboratory certified by ELAP.

If sampling and analysis of contaminated soil demonstrates that it is a hazardous waste, handle and dispose of the soil as hazardous waste. You are the generator of hazardous waste created as the result of spills or leaks for which you are responsible.

Prevent the flow of water, including ground water, from mixing with contaminated soil by using one or a combination of the following measures:

1. Berms
2. Cofferdams
3. Grout curtains
4. Freeze walls
5. Concrete seal course

If water mixes with contaminated soil and becomes contaminated, sample and analyze the water using a laboratory certified by the ELAP. If analysis results demonstrate that the water is a hazardous waste, manage and dispose of the water as hazardous waste.

#### **Department-Generated Hazardous Waste**

If the Department is the generator of hazardous waste during the work performed on this project, use hazardous waste management practices.

Labels must comply with the provisions of 22 CA Code of Regs § 66262.31 and § 66262.32. Mark labels with:

1. Date the hazardous waste is generated
2. The words "Hazardous Waste"
3. Composition and physical state of the hazardous waste (for example, asphalt grindings with thermoplastic or paint)
4. The word "Toxic"
5. Name, address, and telephone number of the Engineer
6. Contract number
7. Contractor or subcontractor name

Handle the containers such that no spillage occurs.

#### **Hazardous Waste Transport and Disposal**

Dispose of hazardous waste within California at a disposal site operating under a permit issued by the DTSC.

The Engineer will obtain the US EPA Generator Identification Number for hazardous waste disposal.

The Engineer will sign all hazardous waste manifests. Notify the Engineer 5 working days before the manifests are to be signed.

The Department will not consider you a generator of the hazardous waste and you will not be obligated for further cleanup, removal, or remedial action for such material if handled or disposed of under these specifications and the appropriate State and federal laws and regulations and county and municipal ordinances and regulations regarding hazardous waste.

#### **Paint Waste**

Clean water-based and oil-based paint from brushes or equipment within a contained area in a way that does not contaminate soil, receiving waters, or storm drain systems. Handle and dispose of the following as hazardous waste: paints, thinners, solvents, residues, and sludges that cannot be recycled or reused. When thoroughly dry, dispose of the following as solid waste: dry latex paint, paint cans, used brushes, rags, absorbent materials, and drop cloths.

All concrete waste generated and located on the bridge structure is required to be removed at the end of each work shift. Use practices to prevent the discharge of asphalt concrete, PCC, and HMA waste into storm drain systems and receiving waters.

Collect and dispose of asphalt concrete, PCC, and HMA waste generated at locations where:

1. Concrete material, including grout, is used
2. Concrete dust and debris result from demolition
3. Sawcutting, coring, grinding, grooving, or hydro-concrete demolition creates a residue or slurry
4. Concrete trucks or other concrete-coated equipment is cleaned at the job site

#### **Sanitary and Septic Waste**

Do not bury or discharge wastewater from a sanitary or septic system within the highway. A sanitary facility discharging into a sanitary sewer system must be properly connected and free from leaks. Place a portable sanitary facility at least 15.24 meters away from storm drains, receiving waters, and flow lines.

Comply with local health agency provisions if using an on-site disposal system.

### **Liquid Waste**

All liquid waste generated and located on the bridge structure is required to be removed at the end of each work shift. Use practices that will prevent job-site liquid waste from entering storm drain systems and receiving waters. Liquid waste include the following:

1. Drilling slurries or fluids
2. Grease-free and oil-free wastewater and rinse water
3. Dredgings, including liquid waste from cleaning drainage systems
4. Liquid waste running off a surface, including wash or rinse water
5. Other nonstormwater liquids not covered by separate permits

Hold liquid waste in structurally sound, leak-proof containers, such as roll-off bins or portable tanks.

Liquid waste containers must be of sufficient quantity and volume to prevent overflow, spills, and leaks.

Store containers at least 15.24 meters from moving vehicles and equipment.

Remove and dispose of deposited solids from sediment traps unless the Engineer approves another method.

Liquid waste may require testing to determine hazardous material content before disposal.

Dispose of drilling fluids and residue.

If a location approved by the Engineer is available within the job site, fluids and residue exempt under 23 CA Code of Regs § 2511(g) may be dried by evaporation in a leak-proof container. Dispose of the remaining as solid waste.

### **Nonstormwater Management**

#### **Water Control and Conservation**

Manage water used for work activities in a way that will prevent erosion and the discharge of pollutants into storm drain systems and receiving waters. Obtain authorization before washing anything at the job site with water that could discharge into a storm drain system or receiving waters. Report discharges immediately.

Implement water conservation practices if water is used at the job site. Inspect irrigation areas. Adjust watering schedules to prevent erosion, excess watering, or runoff. Shut off the water source to broken lines, sprinklers, or valves and repair breaks within 24 hours. Reuse water from waterline flushing for landscape irrigation if practicable. Sweep and vacuum paved areas. Do not wash paved areas with water.

Direct runoff water, including water from water line repair, from the job site to areas where it can infiltrate into the ground. Do not allow runoff water to enter storm drain systems and receiving waters. Do not allow spilled water to escape filling areas for water trucks. Direct water from off-site sources around the job site if practicable. Minimize the contact of off-site water with job site water.

#### **Illegal Connection and Discharge Detection and Reporting**

Before starting work, inspect the job site and the job site's perimeter for evidence of illicit connections, illegal discharges, and dumping. After starting work, inspect the job site and perimeter on a daily schedule for illicit connections and illegal dumping and discharges.

Whenever illegal connections, discharges, or dumping are discovered, notify the Engineer immediately. Do not take further action unless ordered. Assume that unlabeled or unidentifiable material is hazardous.

Look for the following evidence of illicit connections, illegal discharges, and dumping:

1. Debris or trash piles
2. Staining or discoloration on pavement or soils
3. Pungent odors coming from drainage systems
4. Discoloration or oily sheen on water
5. Stains and residue in ditches, channels, or drain boxes
6. Abnormal water flow during dry weather
7. Excessive sediment deposits
8. Nonstandard drainage junction structures
9. Broken concrete or other disturbances at or near junction structures

#### **Vehicle and Equipment Cleaning**

Vehicle and equipment cleaning on the bridge structure is prohibited at any time. Limit vehicle and equipment cleaning or washing at other areas of the job site except what is necessary to control vehicle tracking or hazardous



waste. Notify the Engineer before cleaning vehicles and equipment at the job site with soap, solvents, or steam. Contain and recycle or dispose of resulting waste under "Waste Management" of these special provisions, whichever is applicable. Do not use diesel to clean vehicles or equipment. Minimize the use of solvents.

Clean or wash vehicles and equipment in a structure equipped with disposal facilities. You may wash vehicles in an outside area if the area is:

1. Paved with asphalt concrete, HMA, or PCC
2. Surrounded by a containment berm
3. Equipped with a sump to collect and dispose of wash water

Use as little water as practicable whenever washing vehicles and equipment with water. Hoses must be equipped with a positive shutoff valve.

Discharge liquid from wash racks to a recycling system or to another system approved by the Engineer. Remove liquids and sediment as necessary.

### **Vehicle and Equipment Fueling and Maintenance**

If practicable, perform maintenance on vehicles and equipment off-site. Vehicle and equipment fueling and maintenance is strictly prohibited on the bridge structure unless specifically authorized in writing by the Engineer. If authorized, specific protective measures shall be submitted in writing to Engineer to prevent spills and respond to any spills or leaks.

If fueling or maintenance must be done at the job site, assign a site or sites, and obtain authorization before using them. Minimize mobile fueling and maintenance activities. Fueling and maintenance activities must be performed on level ground in areas protected from stormwater run-on and runoff.

Use containment berms or dikes around fueling and maintenance areas. Keep adequate quantities of absorbent spill-cleanup material and spill kits in the fueling or maintenance area and on fueling trucks. Dispose of spill-cleanup material and kits immediately after use under "Waste Management" of these special provisions. Use drip pans or absorbent pads during fueling or maintenance.

Do not leave fueling or maintenance areas unattended during fueling and maintenance activities. Fueling nozzles must be equipped with an automatic shutoff control. Nozzles must be equipped with vapor-recovery fueling nozzles where required by the Air Quality Management District. Secure nozzles in an upright position when not in use. Do not top off fuel tanks.

Recycle or properly dispose of used batteries and tires under "Waste Management" of these special provisions.

If leaks cannot be repaired immediately, remove the vehicle or equipment from the job site.

### **Material and Equipment Used Over Water**

Provide and implement MCCHP during the bridge removal, portion (Cantilever Truss). Place drip pans and absorbent pads under vehicles and equipment used over water. Keep an adequate supply of spill-cleanup material with vehicles and equipment. Place drip pans or plastic sheeting under vehicles and equipment on docks, barges, or other surfaces over water whenever vehicles or equipment will be idle for more than 1 hour.

Furnish watertight curbs or toe boards on barges, platforms, docks, or other surfaces over water to contain material, debris, and tools. Secure material to prevent spills or discharge into the water due to wind.

Report discharges to receiving waters immediately upon discovery. Submit a discharge notification to the Engineer.

### **Structure Removal Over or Adjacent to Water**

Provide and implement MCCHP during the bridge removal, portion (Cantilever Truss). Do not allow demolished material to enter storm drain systems and receiving waters. WPC Manager must inspect demolition and bridge dismantling sites within 75 meters of storm drainage systems or water courses daily. Use covers and platforms approved by the Engineer to collect debris. Use attachments on equipment to catch debris during small demolition activities. Empty debris-catching devices daily.

### **Paving, Sealing, Sawcutting, Grooving, and Grinding Activities**

Prevent material from entering storm drain systems and receiving waters including:

1. Cementitious material
2. Asphaltic material
3. Aggregate or screenings
4. Sawcutting, grooving, and grinding residue

5. Pavement chunks
6. Shoulder backing
7. Methacrylate
8. Sandblasting residue

Cover drainage inlets and use linear sediment barriers to protect downhill receiving waters until paving, sealing, sawcutting, grooving, and grinding activities are completed and excess material has been removed. Cover drainage inlets and manholes during the application of seal coat, tack coat, slurry seal, or fog seal.

Whenever precipitation is forecasted, limit paving, sawcutting, and grinding to places where runoff can be captured.

Do not start seal coat, tack coat, slurry seal, or fog seal activities whenever precipitation is forecasted during the application and curing period. Do not excavate material from existing roadways during precipitation.

Use a vacuum to remove slurry immediately after slurry is produced. Do not allow the slurry to run onto lanes open to traffic or off the pavement.

Collect the residue from PCC grooving and grinding activities with a vacuum attachment on the grinding machine. Do not leave the residue on the pavement or allow the residue to flow across pavement.

You may stockpile material excavated from existing roadways under "Material Management" of these special provisions if approved by the Engineer.

Do not coat asphalt trucks and equipment with substances that contain soap, foaming agents, or toxic chemicals.

Park paving equipment over drip pans or plastic sheeting with absorbent material to catch drips if the paving equipment is not in use.

### **Thermoplastic Striping and Pavement Markers**

Do not preheat, transfer, or load thermoplastic within 15.24 meters of drainage inlets and receiving waters.

Do not unload, transfer, or load bituminous material for pavement markers within 15.24 meters of drainage inlets and receiving waters.

Collect and dispose of bituminous material from the roadway after removing markers under "Waste Management" of these special provisions.

### **Pile Driving**

Keep spill kits and cleanup materials at pile driving locations. Park pile driving equipment over drip pans, absorbent pads, or plastic sheeting with absorbent material. Protect pile driving equipment by parking on plywood and covering with plastic whenever precipitation is forecasted.

Store pile driving equipment on level ground and protect it from stormwater run-on when not in use. Use vegetable oil instead of hydraulic fluid if practicable.

### **Concrete Curing**

Do not overspray chemical curing compounds. Minimize the drift by spraying as close to the concrete as practicable. Do not allow runoff of curing compounds. Cover drainage inlets before applying the curing compound.

Minimize the use and discharge of water by using wet blankets or similar methods to maintain moisture when concrete is curing.

### **Concrete Finishing**

Collect and dispose of water and solid waste from high-pressure water blasting under "Waste Management" of these special provisions. Collect and dispose of sand and solid waste from sandblasting under "Waste Management" of these special provisions. Before sandblasting, cover drainage inlets within 15.24 meters of sandblasting. Minimize the drift of dust and blast material by keeping the nozzle close to the surface of the concrete. If the character of the blast residue is unknown, test it for hazardous materials and dispose of it properly.

Inspect containment structures for concrete finishing for damage before each day of use and before forecasted precipitation. Remove liquid and solid waste from containment structures after each work shift.

### **Sweeping**

Sweep by hand or mechanical methods, such as vacuuming. Do not use methods that use only mechanical kick brooms.

Sweep paved roads at construction entrance and exit locations and paved areas within the job site:

1. During clearing and grubbing activities
2. During earthwork activities

3. During trenching activities
4. During roadway structural-section activities
5. When vehicles are entering and leaving the job site
6. After soil-disturbing activities
7. After observing off-site tracking of material

Monitor paved areas and roadways within the project. Sweep within:

1. 1 hour whenever sediment or debris is observed during activities that require sweeping
2. 24 hours whenever sediment or debris is observed during activities that do not require sweeping

Remove collected material, including sediment, from paved shoulders, drain inlets, curbs and dikes, and other drainage areas.

Stockpiling or disposal of collected material during sweeping activities is not allowed at the job site.

Keep dust to a minimum during street sweeping activities. Use water or a vacuum whenever dust generation is excessive or sediment pickup is ineffective.

Remove and dispose of trash collected during sweeping under "Waste Management" of these special provisions.

### **Dewatering**

Dewatering consists of discharging accumulated stormwater, groundwater, or surface water from excavations or temporary containment facilities.

Perform dewatering work as specified for the work items involved, such as temporary active treatment system or dewatering and discharge.

If dewatering and discharging activities are not specified under a work item and you perform dewatering activities:

1. Conduct dewatering activities under the Department's Field Guide for Construction Site Dewatering.
2. Ensure that any dewatering discharge does not cause erosion, scour, or sedimentary deposits that could impact natural bedding materials.
3. Discharge the water within the project limits. If the water cannot be discharged within project limits due to site constraints or contamination, dispose of the water as directed by the Engineer.
4. Do not discharge stormwater or nonstormwater that has an odor, discoloration other than sediment, an oily sheen, or foam on the surface. Notify the Engineer immediately upon discovering any such condition.

### **MEASUREMENT AND PAYMENT**

The contract lump sum price paid for construction site management includes full compensation for furnishing all labor, materials, tools, equipment, and incidentals and for doing all the work involved in spill prevention and control, material management, waste management, nonstormwater management, and dewatering activities, including identifying, sampling, testing, handling, and disposing of hazardous waste resulting from your activities, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as ordered by the Engineer.

#### **10-1.09 TEMPORARY FIBER ROLL**

Temporary fiber roll shall be furnished, installed, maintained, and later removed at the locations shown on the approved Storm Water Pollution Prevention Plan (SWPPP) in conformance with "Water Pollution Control" of these special provisions, and in conformance with details shown on the plans and these special provisions.

Temporary fiber roll shall be installed on excavation and embankment slopes and other disturbed soil areas, active or nonactive.

Temporary fiber roll shall be one of the water pollution control practices for sediment control. The SWPPP shall include the use of temporary fiber roll.

Temporary fiber roll shall be either Type 1 or Type 2.

## **MATERIALS**

### **Fiber Roll**

Fiber roll shall be either:

1. Constructed with a premanufactured blanket consisting of either wood excelsior, rice or wheat straw, or coconut fibers or a combination of these materials. The blanket shall be between 2.0 m and 2.4 m in width and between 20 m and 29 m in length. Wood excelsior shall be individual fibers, of which 80 percent shall be 150 mm or longer in length. The blanket shall have biodegradable jute, sisal, or coir fiber netting on at least one side. The blanket shall be rolled along the width and secured with jute twine spaced 2 m apart along the full length of the roll and placed 150 mm from the ends of each roll. The finished roll shall be between 200 mm and 250 mm in diameter, a minimum of 6 m in length, and shall weigh a minimum 0.81-kg/m. More than one blanket may be required to achieve the finished roll diameter. When more than one blanket is required, blankets shall be jointed longitudinally with an overlap of 150 mm along the length of the blanket.
2. A premanufactured roll of rice or wheat straw, wood excelsior, or coconut fiber encapsulated within a biodegradable jute, sisal, or coir fiber netting. The netting shall have a minimum durability of one year after installation. The netting shall be secured tightly at each end of the roll. Rolls shall be between 200 mm and 300 mm in diameter. Rolls between 200 mm and 250 mm in diameter shall have a minimum weight of 1.6 kg/m and a minimum length of 6 m. Rolls between 250 mm and 300 mm in diameter shall have a minimum weight of 4.5 kg/m and a minimum length of 3 m.

### **Stakes**

Wood stakes shall be a minimum of 19 mm x 19 mm x 450 mm in size for Type 1 installation, or a minimum of 19 mm x 38 mm x 450 mm in size for Type 2 installation. Wood stakes shall be untreated fir, redwood, cedar, or pine and cut from sound timber. They shall be straight and free of loose or unsound knots and other defects which would render them unfit for the purpose intended. Metal stakes shall not be used.

### **Rope**

Rope shall be biodegradable, such as sisal or manila, with a minimum diameter of 6.35 mm.

## **INSTALLATION**

Temporary fiber roll shall be installed as follows:

1. Temporary fiber roll (Type 1): Furrows shall be constructed to a depth between 50 mm and 100 mm, and to a sufficient width to hold the fiber roll. Stakes shall be installed 600 mm apart along the length of the fiber rolls and stopped at 300 mm from each end of the rolls. Stakes shall be driven to a maximum of 50 mm above, or flush with the top of the roll.
2. Temporary fiber roll (Type 2): Rope and notched stakes shall be used to restrain the fiber rolls against the slope. Stakes shall be driven into the slope until the notch is even with the top of the fiber roll. Rope shall be knotted at each stake and laced between stakes. After installation of the rope, stakes shall be driven into the slope such that the rope will hold the fiber roll tightly to the slope. Furrows will not be required.
3. Temporary fiber rolls shall be placed 3 m apart along the slope for slope inclination (vertical:horizontal) of 1:2 and steeper, 4.5 m apart along the slope for slope inclination between 1:2 and 1:4, 6 m apart along the slope for slope inclination between 1:4 and 1:10, and a maximum of 15 m apart along the slope for slope inclination of 1:10 and flatter.
4. The bedding area for the fiber roll shall be cleared of obstructions including rocks, clods, and debris greater than 25 mm in diameter before installation.
5. Temporary fiber rolls shall be installed approximately parallel to the slope contour.
6. Temporary fiber rolls shall be installed before the application of other temporary erosion control or soil stabilization materials in the same area.

When no longer required, as determined by the Engineer, temporary fiber rolls shall be removed and disposed of in conformance with the provisions in Section 7-1.13, "Disposal of Material Outside the Highway Right of Way," of the Standard Specifications. Temporary fiber rolls may be abandoned in place when approved in writing by the Engineer.

Ground disturbances including holes and depressions caused by the installation and removal of the temporary fiber roll shall be backfilled and repaired in conformance with the provisions in Section 15-1.02, "Preservation of Property," of the Standard Specifications.

## MAINTENANCE

Temporary fiber rolls shall be maintained to disperse concentrated water runoff and to reduce runoff velocities. Split, torn, or unraveling rolls shall be repaired or replaced. Broken or split stakes shall be replaced. Sagging or slumping fiber rolls shall be repaired with additional stakes or replaced. Locations where rills and other evidence of concentrated runoff have occurred beneath the rolls shall be corrected. Temporary fiber rolls shall be repaired or replaced within 24 hours of identifying the deficiency.

## MEASUREMENT AND PAYMENT

Quantities of temporary fiber rolls to be paid for will be determined by the meter measured along the centerline of the installed roll. Where temporary fiber rolls are joined and overlapped, the overlap will be measured as a single installed roll.

The contract price paid per meter for temporary fiber roll shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in installing temporary fiber rolls, complete in place, including furrow excavation and backfill, and removal, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

Damage to temporary fiber rolls resulting from the Contractor's vehicles, equipment, or operations shall be repaired at the Contractor's expense.

The cost of maintaining temporary fiber rolls will be borne equally by the State and the Contractor. The division of cost will be made by determining the cost of maintaining temporary fiber rolls in conformance with the provisions in Section 9-1.03, "Force Account Payment," of the Standard Specifications and paying half of that cost to the Contractor.

Cleanup, repair, removal, disposal, or replacement due to improper installation or the Contractor's negligence will not be considered as included in the cost for performing maintenance.

### 10-1.10 TEMPORARY CONSTRUCTION ENTRANCE

Temporary construction entrances shall be constructed, maintained, and later removed at the locations shown on the approved Storm Water Pollution Prevention Plan (SWPPP) in conformance with "Water Pollution Control" of these special provisions, and in conformance with details shown on the plans and these special provisions.

Temporary construction entrances shall be one of the water pollution control practices for tracking control. The SWPPP shall include the use of temporary construction entrances.

Temporary construction entrances shall be either Type 1 or Type 2.

## MATERIALS

### Temporary Entrance Fabric

Temporary entrance fabric shall be manufactured from polyester, nylon, or polypropylene material, or any combination thereof. Temporary entrance fabric shall be a nonwoven, needle-punched fabric, free of needles which may have broken off during the manufacturing process. Temporary entrance fabric shall be permeable and shall not act as a wicking agent.

Temporary entrance fabric shall be manufactured from virgin, recycled, or a combination of virgin and recycled polymer materials. No virgin or recycled materials shall contain biodegradable filler materials that can degrade the physical or chemical characteristics of the finished fabric. The Engineer may order tests to confirm the absence of biodegradable filler materials in conformance to the requirements in ASTM Designation: E 204 (Fourier Transformed Infrared Spectroscopy-FTIR).

Temporary entrance fabric shall conform to the following requirements:

Specification	Requirements
Mass per unit area, grams per square meter, min. ASTM Designation: D 5261	235
Grab tensile strength (25-mm grip), kilonewtons, min. ASTM Designation: D4632*	0.89
Elongation at break, percent min. ASTM Designation: D4632*	50
Toughness, kilonewtons, min. (percent elongation x grab tensile strength)	53

\* or appropriate test method for specific polymer

## **Rocks**

Rocks shall conform to the material quality requirements in Section 72-2.02, "Materials," of the Standard Specifications for shape and for apparent specific gravity, absorption, and durability index. Rocks used for the temporary entrance shall conform to the following sizes:

Square Screen Size (mm)	Percentage Passing	Percentage Retained
150	100	0
75	0	100

## **Corrugated Steel Panels**

Corrugated steel panels shall be prefabricated and shall be pressed or shop welded, with a slot or hooked section to facilitate coupling at the ends of the panels.

## **INSTALLATION**

Temporary construction entrances shall be installed as follows:

1. Before placing the temporary entrance fabric, the areas shall be cleared of all trash and debris. Vegetation shall be removed to the ground level. Trash, debris, and removed vegetation shall be disposed of in conformance with the provisions in Section 7-1.13, "Disposal of Material Outside the Highway Right of Way," of the Standard Specifications.
2. A sump shall be constructed within 6 m of each temporary construction entrance as shown on the plans.
3. Before placing the temporary entrance fabric, the ground shall be graded to a uniform plane. The relative compaction of the top 0.5-m shall be not less than 90 percent. The ground surface shall be free of sharp objects that may damage the temporary entrance fabric, and shall be graded to drain to the sump as shown on the plans.
4. Temporary entrance fabric shall be positioned longitudinally along the alignment of the entrance, as directed by the Engineer.
5. The adjacent ends of the fabric shall be overlapped a minimum length of 300 mm.
6. Rocks to be placed directly over the fabric shall be spread in the direction of traffic, longitudinally and along the alignment of the temporary construction entrance.
7. During spreading of the rocks, vehicles or equipment shall not be driven directly on the fabric. A layer of rocks a minimum 150 mm thick shall be placed between the fabric and the spreading equipment to prevent damage to the fabric.
8. For Type 2 temporary construction entrances, a minimum of 6 coupled panel sections shall be installed for each temporary construction entrance. Before installing the panels, the ground surface shall be cleared of all debris to ensure uniform contact with the ground surface.

Fabric damaged during rock placement shall be repaired by placing a new piece of fabric over the damaged area. The piece of fabric shall be large enough to cover the damaged area and provide a minimum 450-mm overlap on all edges.

Details for a proposed alternative temporary construction entrance or alternative sump shall be submitted to the Engineer for approval at least 7 days before installation. The Contractor may eliminate the sump if approved in writing by the Engineer.

When no longer required as determined by the Engineer, temporary construction entrances shall be removed and disposed of in conformance with the provisions in Section 7-1.13, "Disposal of Material Outside the Highway Right of Way," of the Standard Specifications.

Ground disturbance, including holes and depressions, caused by the installation and removal of the temporary construction entrance, including the sumps, shall be backfilled and repaired in conformance with the provisions in Section 15-1.02, "Preservation of Property," of the Standard Specifications.

While the temporary construction entrance is in use, pavement shall be cleaned and sediment removed at least once a day, and as often as necessary when directed by the Engineer. Soil and sediment or other extraneous material tracked onto existing pavement shall not be allowed to enter drainage facilities.

## **MAINTENANCE**

The Contractor shall maintain temporary construction entrances throughout the contract or until removed. The Contractor shall prevent displacement or migration of the rock surfacing or corrugated steel panels. Significant

depressions resulting from settlement or heavy equipment shall be repaired by the Contractor, as directed by the Engineer.

Temporary construction entrances shall be maintained to minimize tracking of soil and sediment onto existing public roads.

If buildup of soil and sediment deter the function of the temporary construction entrance, the Contractor shall immediately remove and dispose of the soil and sediment, and install additional corrugated steel panels and spread additional rocks to increase the capacity of the temporary construction entrance.

Temporary construction entrances shall be repaired or replaced on the same day the damage occurs. Damage to the temporary construction entrance resulting from the Contractor's vehicles, equipment, or operations shall be repaired at the Contractor's expense.

## **MEASUREMENT AND PAYMENT**

Quantities of temporary construction entrances will be determined from actual count in place.

The contract unit price paid for temporary construction entrance shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in constructing temporary construction entrance, complete in place, including excavation and backfill, -and removal, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

The cost of maintaining the temporary construction entrance will be borne equally by the State and the Contractor. The division of cost will be made by determining the cost of maintaining temporary construction entrance in conformance with the provisions in Section 9-1.03, "Force Account Payment," of the Standard Specifications and paying to the Contractor one-half of that cost.

Cleanup, repair, removal, disposal, or replacement due to improper installation or the Contractor's negligence will not be considered as included in the cost for performing maintenance.

## **10-1.11 STREET SWEEPING**

### **GENERAL**

#### **Summary**

This work includes street sweeping.

The SWPPP must describe and include the use of street sweeping as a water pollution control practice for sediment control and tracking control.

#### **Submittals**

At least 5 business days before starting clearing and grubbing, earthwork, or other activities with the potential for tracking sediment or debris, submit:

1. Number of sweepers described in the SWPPP
2. Type of sweeper technology

#### **Quality Control and Assurance**

Retain and submit records of street sweeping including:

1. Quantity of sweeping waste disposal
2. Sweeping times and locations

## **CONSTRUCTION**

### **Street Sweepers**

Sweepers must use one of these technologies:

1. Mechanical sweeper followed by a vacuum-assisted sweeper
2. Vacuum-assisted dry (waterless) sweeper
3. Regenerative-air sweeper

### **Operation**

Street sweeping must be done at:

1. Paved roads at job site entrance and exit locations
2. Paved areas within the job site that flow to storm drains or water bodies

### 3. During bridge dismantling and demolition operations

Street sweeping must be done:

1. During clearing and grubbing activities
2. During earthwork activities
3. During trenching activities
4. During roadway structural section activities
5. When vehicles are entering and leaving the job site
6. After soil disturbing activities
7. After observing offsite tracking of material

Monitor paved areas and roadway within the jobsite. Street sweeping must be done:

1. Within 1 hour, if sediment or debris is observed during activities that require sweeping
2. Within 24 hours, if sediment or debris is observed during activities that do not require sweeping

Street sweeping shall start immediately after all contractor's operations that generate debris, including but not limited to removal of epoxy asphalt deck surface, preparation of pavement and concrete deck surfacing, abrasive blasting and blowing clean deck surface, and shall continue until completion of the project, or as directed by the Engineer. The Contractor shall perform maintenance and repair on the sweeper to ensure its effective performance. Street sweeping shall be performed so that dust is minimized. If dust generation is excessive or residue pickup is ineffective as determined by the Engineer, the Contractor will be required to use one of the remaining alternative sweeping technologies described in this section.

The Contractor will be required to use one of the following technologies for all contractor's operations that generate debris, including but not limited to removal of epoxy asphalt deck surface, preparation of pavement and concrete deck surfacing, abrasive blasting and blowing clean deck surface:

1. Mechanical sweeper followed by a vacuum-assisted sweeper, or
2. Vacuum-assisted dry (waterless) sweeper, or
3. Regenerative-air sweeper

At least 1 sweeper must be on the job site at all times when sweeping work is required. The sweeper must be in good working order.

You may stockpile collected material on the jobsite according to the approved SWPPP. Dispose of collected material at least once per week.

Material collected during street sweeping must be removed and disposed of under Section 7-1.13, "Disposal of Material Outside the Highway Right of Way," of the Standard Specifications.

Your WPCM must inspect paved roads at job site access points:

1. Daily if earthwork and other sediment or debris generating activities occur daily
2. Weekly if earthwork and other sediment or debris generating activities do not occur daily
3. When the National Weather Service predicts precipitation with a probability of at least 30 percent

## **MEASUREMENT AND PAYMENT**

The contract lump sum price paid for street sweeping includes full compensation for furnishing all labor, materials, tools, equipment, and incidentals and for doing all the work involved in street sweeping, including disposal of collected material, as shown on the plans, as specified in the Standard Specifications, these special provisions, and as directed by the Engineer.

### **10-1.12 TEMPORARY HYDRAULIC MULCH (BONDED FIBER MATRIX)**

#### **GENERAL**

##### **Summary**

This work includes applying, maintaining, and removing temporary hydraulic mulch (bonded fiber matrix). Hydraulic mulch uses a mixture of fiber, tackifier, and water to stabilize active and nonactive disturbed soil areas.

The SWPPP must describe and include the use of temporary hydraulic mulch (bonded fiber matrix) as a water pollution control practice for soil stabilization.



### **Submittals**

At least 5 working days before applying hydraulic mulch, submit:

1. Material Safety Data Sheet for the tackifier.
2. Product label describing the tackifier as an erosion control product.
3. List of pollutant indicators and potential pollutants for the use of temporary hydraulic mulch. Pollutant indicators are described under "Sampling and Analysis Plan for Non-Visible Pollutants" in the Preparation Manual.
4. Determination of acute and chronic toxicity for aquatic organisms conforming to EPA methods for the tackifier.
5. Composition of ingredients including chemical formulation.

Submit a Certificate of Compliance as specified in Section 6-1.07, "Certificates of Compliance" of the Standard Specifications for:

1. Tackifier
2. Fiber

### **Quality Control and Assurance**

Retain and submit records of temporary hydraulic mulch applications including:

1. Compliance with specified rates
2. Application area
3. Application time
4. Quantity

## **MATERIALS**

### **Tackifier**

The tackifier must be:

1. Nonflammable
2. Nontoxic to aquatic organisms
3. Free from growth or germination inhibiting factors
4. Bonded to the fiber or prepackaged with the fiber by the manufacturer
5. At least 10 percent of the weight of the dry fiber and include the weight of the activating agents and additives
6. Organic, high viscosity colloidal polysaccharide with activating agents, or a blended hydrocolloid-based binder

### **Fiber**

Fiber must be:

1. Long strand, whole wood fibers, thermo-mechanically processed from clean, whole wood chips
2. Not made from sawdust, cardboard, paper, or paper byproducts
3. At least 25 percent of fibers 10 mm long
4. At least 50 percent held on a 710  $\mu$ m sieve
5. Free from lead paint, printing ink, varnish, petroleum products, seed germination inhibitors, or chlorine bleach
6. Free from synthetic or plastic materials
7. At most 7 percent ash

### **Coloring Agent**

Use a biodegradable nontoxic coloring agent free from copper, mercury, and arsenic to ensure the hydraulic mulch contrasts with the application area.

## CONSTRUCTION

### Application

Apply temporary hydraulic mulch when an area is ready to receive temporary erosion control under "Move-in/Move-out (Temporary Erosion Control)."

Dilute hydraulic mulch with water to spread the mulch evenly.

Use hydroseeding equipment to apply hydraulic mulch.

Apply hydraulic mulch:

1. In the proportions indicated in the table below. Successive applications or passes may be needed to achieve the required proportion rate:

Material	Application Rate kg/ha
Bonded Fiber (includes fiber and tackifier material)	3,500kg/ha

2. To form a continuous mat with no gaps between the mat and the soil surface.
3. From 2 or more directions to achieve a continuous mat.
4. In layers to avoid slumping and to aid drying.
5. During dry weather or at least 24 hours before predicted rain.

Do not apply hydraulic mulch if:

1. Water is standing on or moving across the soil surface
2. Soil is frozen
3. Air temperature is below 4 °C during the tackifier curing period unless allowed by the tackifier manufacturer and approved by the Engineer

Do not over-spray hydraulic mulch onto the traveled way, sidewalks, lined drainage channels, or existing vegetation.

### Maintenance

Reapply hydraulic mulch within 24 hours of discovering visible erosion unless the Engineer approves a longer period.

### Removal

Remove hydraulic mulch by mechanically blending it into the soil with track laying equipment, disking, or other approved method.

Temporary hydraulic mulch disturbed or displaced by your vehicles, equipment, or operations must be reapplied at your expense.

Cleanup, repair, removal, disposal, or replacement due to improper installation or your negligence are not included in the cost for performing maintenance.

## MEASUREMENT AND PAYMENT

Temporary hydraulic mulch (bonded fiber matrix) is measured by the square meter from measurements along the slope of the areas covered by the hydraulic mulch.

The contract price paid per square meter for temporary hydraulic mulch (bonded fiber matrix) includes full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in applying temporary hydraulic mulch, complete in place, including removal of hydraulic mulch, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

The State and you share the cost of maintaining the temporary hydraulic mulch. The State determines the maintenance cost under Section 9-1.03, "Force Account Payment," of the Standard Specifications and pays you one-half of that cost.

### 10-1.13 TEMPORARY COVER

Temporary cover shall be furnished, installed, maintained, and later removed at the locations shown on the approved Storm Water Pollution Prevention Plan (SWPPP) in conformance with "Water Pollution Control" of these special provisions, and in conformance with details shown on the plans and these special provisions.

Temporary cover shall be one of the water pollution control practices for soil stabilization. The SWPPP shall include the use of temporary cover.

#### MATERIALS

##### Temporary Cover Fabric

Temporary cover fabric shall be either a geotextile (engineering fabric) or a geomembrane (plastic sheeting) conforming to the following requirements:

1. Geotextile shall be a woven, slit film fabric which is also known as woven tape. The fabric shall be nonbiodegradable, resistant to deterioration by sunlight, and inert to most soil chemicals. Edges of the film fabric shall be selvedge or serge to prevent unraveling. The film fabric shall also conform to the following requirements:

Specification	Requirements
Grab tensile strength (25-mm grip), kilonewtons, min. ASTM Designation: D4632*	0.89
Elongation at break, percent min. ASTM Designation: D4632*	15
Toughness, kilonewtons, min. (percent elongation x grab tensile strength)	13.3
Permittivity, l/sec, max. (liters per minute per square meter) ASTM Designation: D 4491	0.08 (244)
Ultraviolet light stability, percent tensile strength retained after 500 hours, min. ASTM Designation: D 4355 (xenon arc lamp method)	70

\* or appropriate test method for specific polymer

2. The geomembrane shall consist of 0.25-mm thick, single-ply material in conformance with the requirements in ASTM Designation: D 5199.

Temporary cover fabric shall be manufactured from polyethylene, polypropylene, or comparable polymers. The polymer materials may be virgin, recycled, or a combination of virgin and recycled materials. The polymer materials shall not contain biodegradable filler materials that can degrade the physical or chemical characteristics of the finished fabric. The Engineer may order tests to confirm the absence of biodegradable filler materials in conformance with the requirements in ASTM Designation: E 204 (Fourier Transformed Infrared Spectroscopy-FTIR).

#### Restrainers

Restrainers for securing the temporary cover fabric on slopes and stockpiles shall consist of one or a combination of the following:

1. Gravel-filled bags used as restrainers shall be knotted, roped, and placed at a maximum of 2 m apart on the temporary cover fabric as shown on the plans. Gravel-filled bags shall be between 13 kg and 22 kg in mass, between 600 mm and 800 mm in length, and between 400 mm and 500 mm in width. Gravel bag fabric shall be nonwoven polypropylene geotextile with a minimum unit weight of 270 g/m<sup>2</sup>. The fabric shall have a minimum grab tensile strength (25-mm grip) of 0.89-kN in conformance with the requirements in ASTM Designation: D 4632, and an ultraviolet (UV) stability of 70 percent tensile strength retained after 500 hours in conformance with the requirements in ASTM Designation: D 4355, xenon arc lamp method. Gravel shall consist of noncohesive material between 10 mm and 20 mm in diameter, free of clay balls, organic matter, and other deleterious material. The openings of gravel-filled bags shall be secured to prevent escape of gravel.

2. Restrainers consisting of a steel anchor with a wooden lath shall be fabricated and placed as shown on the plans. Wooden lath shall conform to the provisions in Section 20-2.12, "Lumber," of the Standard Specifications and shall be fir or pine, 38 mm x 89 mm in size, and 2.4 m in length. The wooden lath shall be secured to the temporary cover with steel anchors placed 1.2 m apart along the lath.

The Contractor may use an alternative restrainer if approved by the Engineer in writing. The Contractor shall submit details for an alternative restrainer to the Engineer before installation. The alternative restrainer shall be installed and maintained in conformance with these special provisions.

## **INSTALLATION**

Temporary cover shall be installed as follows:

1. Temporary cover fabric shall be placed and anchored as shown on the plans.
2. Abutting edges of the temporary cover fabric shall overlap a minimum of 600 mm. Nonabutting edges shall be embedded in the soil a minimum of 150 mm.
3. Restrainers shall be placed at the overlap area and along the toe of the slope. Restrainers outside the overlap areas shall be placed at a maximum spacing of 2.4 m.
4. Steel anchors shall be installed to allow the leg of the steel anchor to pierce through the temporary cover fabric into the slope with the crown section securing the wooden lath firmly against the slope.
5. Earthen berm, a linear sediment barrier, shall be constructed adjacent to the toe of the slope with a minimum height of 200 mm and a minimum width of 940 mm. The earthen berm shall be hand or mechanically compacted. Alternative linear sediment barrier may be used if approved by the Engineer in writing.

If the Contractor removes the temporary cover in order to facilitate other work, the temporary cover shall be replaced and secured.

When no longer required as determined by the Engineer, temporary cover shall be removed and disposed of in conformance with the provisions in Section 7-1.13, "Disposal of Material Outside the Highway Right of Way," of the Standard Specifications.

Ground disturbances, including holes and depressions, caused by the installation and removal of the temporary cover shall be backfilled and repaired in conformance with the provisions in Section 15-1.02, "Preservation of Property," of the Standard Specifications.

## **MAINTENANCE**

The Contractor shall maintain the temporary cover throughout the contract to prevent displacement or migration of the material on the slope or stockpiled.

Temporary cover shall be maintained to minimize exposure of the protected area. Restrainers shall be relocated and secured as needed to restrain the temporary cover fabric in place. Temporary cover that breaks free shall be immediately secured. Holes, tears, and voids in the temporary cover fabric shall be patched, repaired, or replaced. When patches or repairs are unacceptable as determined by the Engineer, the temporary cover shall be replaced.

Temporary cover shall be repaired or replaced on the same day when the damage occurs. Damage to the temporary cover resulting from the Contractor's vehicles, equipment, or operations shall be repaired at the Contractor's expense.

## **MEASUREMENT AND PAYMENT**

The quantity of temporary cover to be paid for will be measured by the square meter for the actual area covered.

The contract price paid per square meter for temporary cover shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in installing temporary cover, complete in place, including trench excavation and backfill, maintenance, and removal of temporary cover, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

### **10-1.14 TEMPORARY CONCRETE WASHOUT (PORTABLE)**

#### **GENERAL**

##### **Summary**

This work includes removal and disposal of concrete waste by furnishing, maintaining, and removing portable temporary concrete washouts.

SWPPP must describe and include the use of a portable temporary concrete washout as a water pollution control practice for waste management and materials pollution control.

### **Submittals**

At least 5 working days before concrete activities start, submit:

1. Name and location of off-site concrete waste disposal facility to receive concrete waste
2. Copy of permit issued by RWQCB for off-site commercial disposal facility
3. Copy of license for off-site commercial disposal facility
4. Copy of permit issued by state or local agency having jurisdiction over disposal facility if disposal site is located outside of the State of California

### **Quality Control and Assurance**

Retain and submit records of disposed concrete waste including:

1. Weight tickets
2. Delivery and removal of temporary concrete washouts

## **MATERIALS**

### **Portable Temporary Concrete Washout**

Portable temporary concrete washout must:

1. Be a commercially available watertight container.
2. Have sufficient capacity to contain all liquid and concrete waste generated by washout activities without seepage or spills.
3. Have at least 0.20 cubic meter capacity.
4. Be labeled for the exclusive use as a concrete waste and washout facility. Stencil "Concrete Waste material" in 75 mm high letters on white background. Top of stenciling must be 305 mm from the top of the container.

### **Concrete Washout Sign**

Concrete washout sign must comply with the provisions in Section 12-3.06B, "Portable Signs" of the Standard Specifications and:

1. Be approved by the Engineer
2. Consist of base, framework, and sign panel
3. Be made of plywood
4. Be minimum 610 mm x 1220 mm in size
5. Read "Concrete Washout" with 75 mm high black letters on white background

## **CONSTRUCTION**

### **Placement**

Place portable temporary concrete washouts at job site:

1. Before concrete placement activities start
2. In the immediate area of concrete work as approved by the Engineer
3. No closer than 15.25 meters from storm drain inlets, open drainage facilities, ESAs, or watercourses
4. Away from construction traffic or public access areas

Install a concrete washout sign adjacent to each portable temporary concrete washout location.

### **Operation**

Use portable temporary concrete washouts for:

1. Washout from concrete delivery trucks
2. Slurries containing portland cement concrete or hot mix asphalt from sawcutting, coring, grinding, grooving, and hydro-concrete demolition

### 3. Concrete waste from mortar mixing stations

Relocate portable temporary concrete washouts as needed for concrete construction work.

Replace portable temporary concrete washouts when filled to capacity. Do not fill higher than 6 inches below rim.

Your WPC manager must inspect portable temporary concrete washouts:

1. Daily if concrete work occurs daily
2. Weekly if concrete work does not occur daily

### **Maintenance**

When relocating or transporting a portable temporary concrete washout within the job site, secure it to prevent spilling of concrete waste material. If any spilled material is observed, remove spilled material and place it into portable temporary concrete washout.

### **Removal**

Dispose of concrete waste material at a facility specifically licensed to receive solid concrete waste, liquid concrete waste, or both. When portable temporary concrete washout is full, remove and dispose of concrete waste within 2 days.

### **PAYMENT**

The contract lump sum price paid for temporary concrete washout (portable) includes full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in furnishing, maintaining, and removing the portable temporary concrete washout, including removal and disposal of concrete waste, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

### **10-1.15 TEMPORARY CHECK DAM**

Temporary check dams shall be constructed, maintained, and later removed at the locations shown on the approved Storm Water Pollution Prevention Plan (SWPPP) in conformance with "Water Pollution Control" of these special provisions, and in conformance with details shown on the plans and these special provisions.

Temporary check dams shall be one of the water pollution control practices for sediment control. The SWPPP shall include the use of temporary check dams.

Temporary check dams shall be either Type 1 (fiber roll) or Type 2 (gravel bag).

### **MATERIALS**

#### **Fiber Roll**

Fiber rolls shall be one of the following:

1. Constructed with a premanufactured blanket consisting of one material or a combination of materials consisting of wood excelsior, rice or wheat straw, or coconut fibers. The blanket shall be between 2.0 m and 2.4 m in width and between 20 m and 29 m in length. Wood excelsior shall be individual fibers, of which 80 percent shall be 150 mm or longer in length. The blanket shall have a biodegradable jute, sisal, or coir fiber netting on at least one side. The blanket shall be rolled along the width and secured with jute twine spaced 2 m apart along the full length of the roll and placed 150 mm from the ends of each roll. The finished roll shall be between 200 mm and 250 mm in diameter, between 3 m and 6 m in length and shall weigh at least 0.81-kg/m. More than one blanket may be required to achieve the finished roll diameter. When more than one blanket is required, blankets shall be jointed longitudinally with an overlap of 150 mm along the length of the blanket.
2. A premanufactured roll of rice or wheat straw, wood excelsior, or coconut fiber encapsulated within a biodegradable jute, sisal, or coir fiber netting. Rolls shall be between 200 mm and 250 mm in diameter, between 3 m and 6 m in length and shall weigh at least 1.6 kg/m. The netting shall have a minimum durability of one year after installation. The netting shall be secured tightly at each end of the rolls.

#### **Stakes**

Wood stakes shall be a minimum of 19 mm x 38 mm x 450 mm. Wood stakes shall be untreated fir, redwood, cedar, or pine and cut from sound timber. They shall be straight and free of loose or unsound knots or other defects which would render them unfit for the purpose intended. Metal stakes may be used as an alternative. The

Contractor shall submit a sample of the metal stake for the Engineer's approval before installation. The tops of the metal stakes shall be bent at a 90-degree angle.

### **Rope**

Rope shall be biodegradable, such as sisal or manila, with a minimum diameter of 6.35 mm.

### **Gravel-filled Bag**

Gravel bag fabric shall be nonwoven polypropylene geotextile (or comparable polymer) and shall conform to the following requirements:

Specification	Requirements
Mass per unit area, grams per square meter, min. ASTM Designation: D 5261	270
Grab tensile strength (25-mm grip), kilonewtons, min. ASTM Designation: D4632*	0.89
Ultraviolet stability, percent tensile strength retained after 500 hours, ASTM Designation: D4355, xenon arc lamp method	70

\* or appropriate test method for specific polymer

Gravel bags shall be between 600 mm and 800 mm in length, and between 400 mm and 500 mm in width.

Yarn used in construction of the gravel bags shall be as recommended by the manufacturer or bag supplier and shall be of a contrasting color.

Gravel shall be between 10 mm and 20 mm in diameter, and shall be clean and free from clay balls, organic matter, and other deleterious materials. The opening of gravel-filled bags shall be secured to prevent gravel from escaping. Gravel-filled bags shall be between 13 kg and 22 kg in mass.

## **INSTALLATION**

Temporary check dams shall be installed as follows:

1. Temporary check dam (Type 1): Rope and notched stakes shall be used to restrain the fiber rolls against the surface of the unlined ditch or swale. Stakes shall be driven into the slope until the notch is even with the top of the fiber roll. Rope shall be knotted at each stake and laced between stakes. After installation of the rope, stakes shall be driven into the slope so that the rope will hold the fiber roll tightly to the slope. Furrows will not be required. If metal stakes are used, the rope may be laced and knotted on the bend at the top of the metal stakes.
2. Temporary check dam (Type 2): A single layer of gravel bags shall be placed in lined or unlined ditches with ends abutted tightly and not overlapped.
3. The bedding area for the temporary check dam shall be cleared of obstructions including, rocks, clods, and debris greater than 25 mm in diameter before installation.
4. The temporary check dam shall be installed across and approximately perpendicular to the centerline of a ditch or drainage line.
5. The temporary check dam shall be installed with sufficient spillway depth to prevent flanking of concentrated flow around the ends of the check dam.
6. The temporary check dam shall be installed in an unlined ditch or swale before the application of other temporary erosion control or soil stabilization material in the same unlined ditch or swale.
7. The temporary check dam shall be installed upon completion of temporary erosion control blanket in earthen ditches or swales.

Details for an alternative temporary check dam shall be submitted to the Engineer for approval at least 7 days before installation.

When the temporary check dam is no longer required, as determined by the Engineer, it shall be removed and disposed of in conformance with the provisions in Section 7-1.13, "Disposal of Material Outside the Highway Right of Way," of the Standard Specifications.

Ground disturbances including holes and depressions caused by the installation and removal of the temporary check dam shall be backfilled and repaired in conformance with the provisions in Section 15-1.02, "Preservation of Property," of the Standard Specifications.

## **MAINTENANCE**

Temporary check dams shall be maintained to provide sediment holding capacity and to reduce runoff velocities. Split, torn, or unraveling rolls shall be repaired or replaced. Broken or split stakes shall be replaced. Sagging or slumping fiber rolls shall be repaired with additional stakes or replaced. Gravel bags shall be replaced when the bag material is ruptured or when the yarn has failed, allowing the bag contents to spill out. Locations where rills and other evidence of concentrated runoff have occurred beneath the check dams shall be corrected.

When sediment exceeds 1/3 of the height of the check dam above ground, or when directed by the Engineer, sediment shall be removed. The removed sediment shall be deposited within the project limits so that the sediment is not subject to erosion by wind or by water.

Temporary check dams shall be repaired or replaced the same day damage occurs. Washouts or scour beneath the temporary check dam shall be repaired. Temporary check dams damaged during the progress of work or resulting from the Contractor's vehicles, equipment, or operations shall be repaired or replaced at the Contractor's expense.

## **MEASUREMENT AND PAYMENT**

Quantities of temporary check dams to be paid for will be determined by the meter measured along the centerline of the installed check dam.

The contract price paid per meter for temporary check dam shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in installing temporary check dams, complete in place, including maintenance, and removal, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

### **10-1.16 TEMPORARY FIBER ROLL**

Temporary fiber roll shall be furnished, installed, maintained, and later removed at the locations shown on the approved Storm Water Pollution Prevention Plan (SWPPP) in conformance with "Water Pollution Control" of these special provisions, and in conformance with details shown on the plans and these special provisions.

Temporary fiber roll shall be installed on excavation and embankment slopes and other disturbed soil areas, active or nonactive.

Temporary fiber roll shall be one of the water pollution control practices for sediment control. The SWPPP shall include the use of temporary fiber roll.

Temporary fiber roll shall be either Type 1 or Type 2.

## **MATERIALS**

### **Fiber Roll**

Fiber roll shall be either:

1. Constructed with a premanufactured blanket consisting of either wood excelsior, rice or wheat straw, or coconut fibers or a combination of these materials. The blanket shall be between 2.0 m and 2.4 m in width and between 20 m and 29 m in length. Wood excelsior shall be individual fibers, of which 80 percent shall be 150 mm or longer in length. The blanket shall have biodegradable jute, sisal, or coir fiber netting on at least one side. The blanket shall be rolled along the width and secured with jute twine spaced 2 m apart along the full length of the roll and placed 150 mm from the ends of each roll. The finished roll shall be between 200 mm and 250 mm in diameter, a minimum of 6 m in length, and shall weigh a minimum 0.81-kg/m. More than one blanket may be required to achieve the finished roll diameter. When more than one blanket is required, blankets shall be jointed longitudinally with an overlap of 150 mm along the length of the blanket.
2. A premanufactured roll of rice or wheat straw, wood excelsior, or coconut fiber encapsulated within a biodegradable jute, sisal, or coir fiber netting. The netting shall have a minimum durability of one year after installation. The netting shall be secured tightly at each end of the roll. Rolls shall be between 200 mm and 300 mm in diameter. Rolls between 200 mm and 250 mm in diameter shall have a minimum weight of 1.6 kg/m and a minimum length of 6 m. Rolls between 250 mm and 300 mm in diameter shall have a minimum weight of 4.5 kg/m and a minimum length of 3 m.



### **Stakes**

Wood stakes shall be a minimum of 19 mm x 19 mm x 450 mm in size for Type 1 installation, or a minimum of 19 mm x 38 mm x 450 mm in size for Type 2 installation. Wood stakes shall be untreated fir, redwood, cedar, or pine and cut from sound timber. They shall be straight and free of loose or unsound knots and other defects which would render them unfit for the purpose intended. Metal stakes shall not be used.

### **Rope**

Rope shall be biodegradable, such as sisal or manila, with a minimum diameter of 6.35 mm.

### **INSTALLATION**

Temporary fiber roll shall be installed as follows:

1. Temporary fiber roll (Type 1): Furrows shall be constructed to a depth between 50 mm and 100 mm, and to a sufficient width to hold the fiber roll. Stakes shall be installed 600 mm apart along the length of the fiber rolls and stopped at 300 mm from each end of the rolls. Stakes shall be driven to a maximum of 50 mm above, or flush with the top of the roll.
2. Temporary fiber roll (Type 2): Rope and notched stakes shall be used to restrain the fiber rolls against the slope. Stakes shall be driven into the slope until the notch is even with the top of the fiber roll. Rope shall be knotted at each stake and laced between stakes. After installation of the rope, stakes shall be driven into the slope such that the rope will hold the fiber roll tightly to the slope. Furrows will not be required.
3. Temporary fiber rolls shall be placed 3 m apart along the slope for slope inclination (vertical:horizontal) of 1:2 and steeper, 4.5 m apart along the slope for slope inclination between 1:2 and 1:4, 6 m apart along the slope for slope inclination between 1:4 and 1:10, and a maximum of 15 m apart along the slope for slope inclination of 1:10 and flatter.
4. The bedding area for the fiber roll shall be cleared of obstructions including rocks, clods, and debris greater than 25 mm in diameter before installation.
5. Temporary fiber rolls shall be installed approximately parallel to the slope contour.
6. Temporary fiber rolls shall be installed before the application of other temporary erosion control or soil stabilization materials in the same area.

When no longer required, as determined by the Engineer, temporary fiber rolls shall be removed and disposed of in conformance with the provisions in Section 7-1.13, "Disposal of Material Outside the Highway Right of Way," of the Standard Specifications. Temporary fiber rolls may be abandoned in place when approved in writing by the Engineer.

Ground disturbances including holes and depressions caused by the installation and removal of the temporary fiber roll shall be backfilled and repaired in conformance with the provisions in Section 15-1.02, "Preservation of Property," of the Standard Specifications.

### **MAINTENANCE**

Temporary fiber rolls shall be maintained to disperse concentrated water runoff and to reduce runoff velocities. Split, torn, or unraveling rolls shall be repaired or replaced. Broken or split stakes shall be replaced. Sagging or slumping fiber rolls shall be repaired with additional stakes or replaced. Locations where rills and other evidence of concentrated runoff have occurred beneath the rolls shall be corrected. Temporary fiber rolls shall be repaired or replaced within 24 hours of identifying the deficiency.

### **MEASUREMENT AND PAYMENT**

Quantities of temporary fiber rolls to be paid for will be determined by the meter measured along the centerline of the installed roll. Where temporary fiber rolls are joined and overlapped, the overlap will be measured as a single installed roll.

The contract price paid per meter for temporary fiber roll shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in installing temporary fiber rolls, complete in place, including furrow excavation and backfill, and removal, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

Damage to temporary fiber rolls resulting from the Contractor's vehicles, equipment, or operations shall be repaired at the Contractor's expense.

The cost of maintaining temporary fiber rolls will be borne equally by the State and the Contractor. The division of cost will be made by determining the cost of maintaining temporary fiber rolls in conformance with the

provisions in Section 9-1.03, "Force Account Payment," of the Standard Specifications and paying half of that cost to the Contractor.

Cleanup, repair, removal, disposal, or replacement due to improper installation or the Contractor's negligence will not be considered as included in the cost for performing maintenance.

#### **10-1.17 TEMPORARY SILT FENCE**

Temporary silt fence shall be furnished, installed, maintained, and later removed at the locations shown on the approved Storm Water Pollution Prevention Plan (SWPPP) in conformance with "Water Pollution Control" of these special provisions, and in conformance with details shown on the plans and these special provisions.

Temporary silt fence shall be one of the water pollution control practices for sediment control. The SWPPP shall include the use of temporary silt fence.

#### **MATERIALS**

Temporary silt fence shall either be prefabricated or constructed with silt fence fabric, posts, and fasteners.

##### **Silt Fence Fabric**

Silt fence fabric shall be geotextile manufactured from woven polypropylene or polymer material. Silt fence fabric may be virgin, recycled, or a combination of virgin and recycled polymer materials. No virgin or recycled polymer materials shall contain biodegradable filler materials that can degrade the physical or chemical characteristics of the finished fabric. The Engineer may order tests to confirm the absence of biodegradable filler materials in conformance to the requirements in ASTM Designation: E 204 (Fourier Transformed Infrared Spectroscopy-FTIR).

Silt fence fabric shall conform to the following requirements:

Specification	Requirements
Width, mm, min.	900
Grab tensile strength (25-mm grip), kilonewtons, min. in each direction ASTM Designation: D 4632*	0.55
Elongation, percent minimum in each direction ASTM Designation: D 4632*	15
Permittivity, 1/sec., min. ASTM Designation: D 4491	0.05
Flow rate, liters per minute per square meter, min. ASTM Designation: D 4491	400
Ultraviolet stability, percent tensile strength retained after 500 hours, min. ASTM Designation: D 4355 (xenon-arc lamp and water spray weathering method)	70

\* or appropriate test method for specific polymer

##### **Posts**

Posts for temporary silt fence shall be one of the following:

1. Untreated fir or pine, a minimum of 34 mm x 40 mm in size, and 1.2 m in length. One end of the post shall be pointed.
2. Steel and have a "U," "T," "L," or other cross sectional shape that can resist failure from lateral loads. The steel posts shall have a minimum mass per length of 1.1 kg/m and a minimum length of 1.2 m. One end of the steel posts shall be pointed and the other end shall be capped with an orange or red plastic safety cap which fits snugly to the steel post. The Contractor shall submit to the Engineer for approval a sample of the capped steel post before installation.

##### **Fasteners**

Fasteners for attaching silt fence fabric to posts shall be as follows:

1. When prefabricated silt fence is used, posts shall be inserted into sewn pockets.
2. Silt fence fabric shall be attached to wooden posts with nails or staples as shown on the plans or as recommended by the manufacturer or supplier. Tie wire or locking plastic fasteners shall be used to fasten the silt fence fabric to steel posts. Maximum spacing of fasteners shall be 200 mm along the length of the steel post.

## **INSTALLATION**

Temporary silt fence shall be installed parallel with the slope contour in reaches not to exceed 150 m. A reach is considered a continuous run of temporary silt fence from end to end or from an end to an opening, including joined panels. Each reach shall be constructed so that the elevation at the base of the fence does not deviate from the contour more than 1/3 of the fence height.

The silt fence fabric shall be installed on the side of the posts facing the slope. The silt fence fabric shall be anchored in a trench as shown on the plans. The trench shall be backfilled and mechanically or hand tamped to secure the silt fence fabric in the bottom of the trench.

Mechanically pushing 300 mm of the silt fence fabric vertically through the soil may be allowed if the Contractor can demonstrate to the Engineer that the silt fence fabric will not be damaged and will not slip out of the soil resulting in sediment passing under the silt fence fabric.

The maximum post spacing may be increased to 3 m if the fence is reinforced by a wire or plastic material by prefabrication or by field installation. The field-assembled reinforced temporary silt fence shall be able to retain saturated sediment without collapsing.

Temporary silt fence shall be joined as shown on the plans. The tops of the posts shall be tied together by minimum of 2 wraps of tie wire of a minimum 1.5-mm diameter. The silt fence fabric shall be attached to the posts at the joint as specified in these special provisions.

When no longer required as determined by the Engineer, temporary silt fence shall be removed and disposed of in conformance with the provisions in Section 7-1.13, "Disposal of Material Outside the Highway Right of Way," of the Standard Specifications. Trimming the silt fence fabric and leaving it in place will not be allowed.

Ground disturbance, including holes and depressions, caused by the installation and removal of the temporary silt fence shall be backfilled and repaired in conformance with the provisions in Section 15-1.02, "Preservation of Property," of the Standard Specifications.

## **MAINTENANCE**

Temporary silt fence shall be maintained to provide a sediment holding capacity of approximately 1/3 the height of the silt fence fabric above ground. When sediment exceeds this height or when directed by the Engineer, sediment shall be removed. The removed sediment shall be deposited within the project limits so that the sediment is not subject to erosion by wind or by water.

Temporary silt fence shall be repaired or replaced the same day the damage occurs. Damage to the temporary silt fence resulting from the Contractor's vehicles, equipment, or operations shall be repaired at the Contractor's expense.

## **MEASUREMENT AND PAYMENT**

Quantities of temporary silt fence to be paid for will be determined by the meter, measured parallel with the ground slope along the line of the installed temporary silt fence, deducting the widths of openings.

The contract price paid per meter for temporary silt fence shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in installing temporary silt fence, complete in place, including trench excavation and backfill, maintenance, and removal, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

### **10-1.18 TEMPORARY FENCE**

Temporary fence shall be furnished, constructed, maintained, and later removed as shown on the plans, as specified in these special provisions and as directed by the Engineer.

The temporary fence shall be (Type CL-2.4, Black Vinyl-Clad) with barbed wire extension arm, and shall conform to the requirements in "Chain Link Fence (Type CL-2.4, Black Vinyl-Clad)," of these special provisions.

Except as otherwise specified in this section, temporary fence shall conform to the plan details and the specifications for permanent fence of similar character as provided in Section 80, "Fences," of the Standard Specifications.

Used materials may be installed provided the used materials are good, sound and are suitable for the purpose intended, as determined by the Engineer.

Materials may be commercial quality provided the dimensions and sizes of the materials are equal to, or greater than, the dimensions and sizes shown on the plans or specified herein.

Temporary fence that is damaged during the progress of the work shall be repaired or replaced by the Contractor at the Contractor's expense.

When no longer required for the work, as determined by the Engineer, temporary fence shall be removed. Removed facilities shall become the property of the Contractor and shall be removed from the site of the work, except as otherwise provided in this section.

Removed temporary fence materials that are not damaged may be constructed in the permanent work provided the materials conform to the requirements specified for the permanent work and such materials are new when used for the temporary fence.

Holes caused by the removal of temporary fence shall be backfilled in conformance with the provisions in the second paragraph of Section 15-1.02, "Preservation of Property," of the Standard Specifications.

The various types and kinds of temporary fence will be measured and paid for in the same manner specified for permanent fence of similar character as provided in Section 80, "Fences," of the Standard Specifications.

Full compensation for maintaining, removing, and disposing of temporary fence shall be considered as included in the contract prices paid per meter for the various types of temporary fence and no additional compensation will be allowed therefor.

#### **10-1.19 TEMPORARY FENCE (TYPE ESA)**

Temporary fence (Type ESA) shall be furnished, installed, maintained, and later removed in conformance with the details shown on the plans, as specified in these special provisions and as directed by the Engineer.

#### **MATERIALS**

Used materials may be installed provided the used materials conform to these special provisions. Materials for temporary fence (Type ESA) shall conform to the following:

##### **High Visibility Fabric**

High visibility fabric shall be machine produced, orange colored mesh manufactured from polypropylene or polyethylene. High visibility fabric may be made of recycled materials. Materials shall not contain biodegradable filler materials that can degrade the physical or chemical characteristics of the finished fabric. High visibility fabric shall be fully stabilized ultraviolet resistant, shall be a minimum of 1.22 m in width with a maximum mesh opening of 50 mm x 50 mm. High visibility fabric shall be furnished in one continuous width and shall not be spliced to conform to the specified width dimension.

##### **Posts**

Posts for temporary fence (Type ESA) shall be of one of the following:

- A. Wood posts shall be fir or pine, shall have a minimum cross section of 50 mm x 50 mm, and a minimum length of 1.6 m. The end of the post to be embedded in the soil shall be pointed. Wood posts shall not be treated with wood preservative.
- B. Steel posts shall have a "U", "T", "L" or other cross sectional shape that resists failure by lateral loads. Steel posts shall have a minimum mass per length of 1.1 kg/m and a minimum length of 1.6 m. One end of the steel post shall be pointed and the other end shall have a high visibility colored top.

##### **Fasteners**

Fasteners for attaching high visibility fabric to the posts shall be as follows:

- A. The high visibility fabric shall be attached to wooden posts with commercial quality nails or staples, or as recommended by the manufacturer or supplier.
- B. Tie wire or locking plastic fasteners shall be used for attaching the high visibility fabric to steel posts. Maximum spacing of tie wire or fasteners shall be 600 mm along the length of the steel post.

##### **Signs**

The sign legend and dimensions shall be as shown on the plans. The sign shall be weatherproof and fade-proof and may include plastic laminated printed paper affixed to an inflexible weatherproof backer board. The sign panel shall be affixed to the high visibility fabric with tie wire or locking plastic fasteners. The top of the sign panel shall be flush with the top of the high visibility fabric. Sign panels shall be placed at 30 m apart along the length of the temporary fence (Type ESA), and at each end of the fence.

## INSTALLATION

Temporary fence (Type ESA) shall be installed as follows:

- A. All fence construction activities shall be conducted from outside the ESA as shown on the plans or as staked.
- B. Posts shall be embedded in the soil a minimum of 380 mm. Post spacing shall be 2.5 m maximum from center to center and shall at all times support the fence in a vertical position.
- C. Temporary fence (Type ESA) shall be constructed prior to clearing and grubbing work, shall enclose the foliage canopy (drip line) of protected plants, and shall not encroach upon visible roots of the plants.

When Type ESA temporary fence is no longer required, as determined by the Engineer, the temporary fence shall become the property of the Contractor and shall be removed and disposed of in conformance with the provisions in Section 7-1.13, "Disposal of Material Outside the Highway Right of Way," of the Standard Specifications, except when reused as provided in this section.

Holes caused by the removal of temporary fence (Type ESA) shall be backfilled in conformance with the provisions in Section 15-1.02, "Preservation of Property," of the Standard Specifications.

## MAINTENANCE

Temporary fence (Type ESA) that is damaged during the progress of the work shall be repaired or replaced by the Contractor the same day the damage occurs.

## MEASUREMENT AND PAYMENT

Temporary fence (Type ESA) shall be measured and paid for in the same manner specified for permanent fence as provided in Section 80, "Fences," of the Standard Specifications.

Full compensation for maintaining, removing, and disposing of temporary fence (Type ESA) shall be considered as included in the contract price paid per meter for temporary fence (Type ESA) and no additional compensation will be allowed therefor.

### 10-1.20 TEMPORARY GRAVEL BAG BERM

Temporary gravel bag berms shall be furnished, installed, maintained, and later removed at the locations shown on the approved Storm Water Pollution Prevention Plan in conformance with "Water Pollution Control" of these special provisions, and in conformance with details shown on the plans and these special provisions.

Temporary gravel bag berms shall be one of the water pollution control practices for sediment control. The Storm Water Pollution Prevention Plan shall include the use of temporary gravel bag berms.

## MATERIALS

### Gravel-filled Bags

Gravel bag fabric shall be nonwoven polypropylene geotextile (or comparable polymer) and shall conform to the following requirements:

Specification	Requirements
Mass per unit area, grams per square meter, min. ASTM Designation: D 5261	270
Grab tensile strength (25-mm grip), kilonewtons, min. ASTM Designation: D4632*	0.89
Ultraviolet stability, percent tensile strength retained after 500 hours, ASTM Designation: D4355, xenon arc lamp method	70

\* or appropriate test method for specific polymer

Gravel bags shall be between 600 mm and 800 mm in length, and between 400 mm and 500 mm in width.

Yarn used for binding gravel bags shall be as recommended by the manufacturer or bag supplier and shall be of a contrasting color.

Gravel shall be between 10 mm and 20 mm in diameter, and shall be clean and free from clay balls, organic matter, and other deleterious materials. The opening of gravel-filled bags shall be secured to prevent gravel from escaping. Gravel-filled bags shall be between 13 kg and 22 kg in mass.

## **INSTALLATION**

Temporary gravel bag berms shall be installed as follows:

- A. A single layer of gravel bags shall be placed with ends abutted tightly and not overlapped.
- B. The bedding area for the temporary gravel bag berm shall be cleared of obstructions, including rocks, clods, and debris greater than 25 mm in diameter, prior to installation.
- C. Temporary gravel bag berms shall be installed approximately parallel to the slope contour.
- D. The last 2 m of the temporary gravel bag berm shall be angled up-slope.

When no longer required, as determined by the Engineer, temporary gravel bag berm shall be removed and disposed of in conformance with the provisions in Section 7-1.13, "Disposal of Material Outside the Highway Right of Way," of the Standard Specifications.

Ground disturbance, including holes and depressions, caused by the installation and removal of the temporary gravel bag berm shall be backfilled and repaired in conformance with the provisions in Section 15-1.02, "Preservation of Property," of the Standard Specifications.

## **MAINTENANCE**

Temporary gravel bag berms shall be maintained to provide a sediment holding capacity of approximately 1/3 the height of the gravel bag berm above the ground. When sediment exceeds this height, or when directed by the Engineer, sediment shall be removed. Removed sediment shall be deposited within the project limits in such a way that the sediment is not subject to erosion by wind or by water.

Temporary gravel bag berms shall be repaired or replaced on the same day the damage occurs. Damage to the temporary gravel bag berm resulting from the Contractor's vehicles, equipment, or operations shall be repaired at the Contractor's expense.

Gravel bags shall be replaced when the bag material is ruptured or when the yarn has failed, allowing the bag contents to spill out.

## **MEASUREMENT AND PAYMENT**

Quantities of temporary gravel bag berm to be paid for will be determined by the meter, measured along the centerline of the installed temporary gravel bag berm.

The contract price paid per meter for temporary gravel bag berm shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in installing temporary gravel bag berm, complete in place, including backfill, maintenance, and removal, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

### **10-1.21 TEMPORARY CONSTRUCTION ENTRANCE**

Temporary construction entrances shall be constructed, maintained, and later removed at the locations shown on the approved Storm Water Pollution Prevention Plan (SWPPP) in conformance with "Water Pollution Control" of these special provisions, and in conformance with details shown on the plans and these special provisions.

Temporary construction entrances shall be one of the water pollution control practices for tracking control. The SWPPP shall include the use of temporary construction entrances.

Temporary construction entrances shall be either Type 1 or Type 2.

## **MATERIALS**

### **Temporary Entrance Fabric**

Temporary entrance fabric shall be manufactured from polyester, nylon, or polypropylene material, or any combination thereof. Temporary entrance fabric shall be a nonwoven, needle-punched fabric, free of needles which may have broken off during the manufacturing process. Temporary entrance fabric shall be permeable and shall not act as a wicking agent.

Temporary entrance fabric shall be manufactured from virgin, recycled, or a combination of virgin and recycled polymer materials. No virgin or recycled materials shall contain biodegradable filler materials that can degrade the physical or chemical characteristics of the finished fabric. The Engineer may order tests to confirm the absence of biodegradable filler materials in conformance to the requirements in ASTM Designation: E 204 (Fourier Transformed Infrared Spectroscopy-FTIR).

Temporary entrance fabric shall conform to the following requirements:

Specification	Requirements
Mass per unit area, grams per square meter, min. ASTM Designation: D 5261	235
Grab tensile strength (25-mm grip), kilonewtons, min. ASTM Designation: D4632*	0.89
Elongation at break, percent min. ASTM Designation: D4632*	50
Toughness, kilonewtons, min. (percent elongation x grab tensile strength)	53

\* or appropriate test method for specific polymer

### **Rocks**

Rocks shall conform to the material quality requirements in Section 72-2.02, "Materials," of the Standard Specifications for shape and for apparent specific gravity, absorption, and durability index. Rocks used for the temporary entrance shall conform to the following sizes:

Square Screen Size (mm)	Percentage Passing	Percentage Retained
150	100	0
75	0	100

### **Corrugated Steel Panels**

Corrugated steel panels shall be prefabricated and shall be pressed or shop welded, with a slot or hooked section to facilitate coupling at the ends of the panels.

## **INSTALLATION**

Temporary construction entrances shall be installed as follows:

1. Before placing the temporary entrance fabric, the areas shall be cleared of all trash and debris. Vegetation shall be removed to the ground level. Trash, debris, and removed vegetation shall be disposed of in conformance with the provisions in Section 7-1.13, "Disposal of Material Outside the Highway Right of Way," of the Standard Specifications.
2. A sump shall be constructed within 6 m of each temporary construction entrance as shown on the plans.
3. Before placing the temporary entrance fabric, the ground shall be graded to a uniform plane. The relative compaction of the top 0.5-m shall be not less than 90 percent. The ground surface shall be free of sharp objects that may damage the temporary entrance fabric, and shall be graded to drain to the sump as shown on the plans.
4. Temporary entrance fabric shall be positioned longitudinally along the alignment of the entrance, as directed by the Engineer.
5. The adjacent ends of the fabric shall be overlapped a minimum length of 300 mm.
6. Rocks to be placed directly over the fabric shall be spread in the direction of traffic, longitudinally and along the alignment of the temporary construction entrance.
7. During spreading of the rocks, vehicles or equipment shall not be driven directly on the fabric. A layer of rocks a minimum 150 mm thick shall be placed between the fabric and the spreading equipment to prevent damage to the fabric.
8. For Type 2 temporary construction entrances, a minimum of 6 coupled panel sections shall be installed for each temporary construction entrance. Before installing the panels, the ground surface shall be cleared of all debris to ensure uniform contact with the ground surface.

Fabric damaged during rock placement shall be repaired by placing a new piece of fabric over the damaged area. The piece of fabric shall be large enough to cover the damaged area and provide a minimum 450-mm overlap on all edges.

Details for a proposed alternative temporary construction entrance or alternative sump shall be submitted to the Engineer for approval at least 7 days before installation. The Contractor may eliminate the sump if approved in writing by the Engineer.

When no longer required as determined by the Engineer, temporary construction entrances shall be removed and disposed of in conformance with the provisions in Section 7-1.13, "Disposal of Material Outside the Highway Right of Way," of the Standard Specifications.

Ground disturbance, including holes and depressions, caused by the installation and removal of the temporary construction entrance, including the sumps, shall be backfilled and repaired in conformance with the provisions in Section 15-1.02, "Preservation of Property," of the Standard Specifications.

While the temporary construction entrance is in use, pavement shall be cleaned and sediment removed at least once a day, and as often as necessary when directed by the Engineer. Soil and sediment or other extraneous material tracked onto existing pavement shall not be allowed to enter drainage facilities.

## **MAINTENANCE**

The Contractor shall maintain temporary construction entrances throughout the contract or until removed. The Contractor shall prevent displacement or migration of the rock surfacing or corrugated steel panels. Significant depressions resulting from settlement or heavy equipment shall be repaired by the Contractor, as directed by the Engineer.

Temporary construction entrances shall be maintained to minimize tracking of soil and sediment onto existing public roads.

If buildup of soil and sediment deter the function of the temporary construction entrance, the Contractor shall immediately remove and dispose of the soil and sediment, and install additional corrugated steel panels and spread additional rocks to increase the capacity of the temporary construction entrance.

Temporary construction entrances shall be repaired or replaced on the same day the damage occurs. Damage to the temporary construction entrance resulting from the Contractor's vehicles, equipment, or operations shall be repaired at the Contractor's expense.

## **MEASUREMENT AND PAYMENT**

Quantities of temporary construction entrances will be determined from actual count in place.

The contract unit price paid for temporary construction entrance shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in constructing temporary construction entrance, complete in place, including excavation and backfill, -and removal, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

The cost of maintaining the temporary construction entrance will be borne equally by the State and the Contractor. The division of cost will be made by determining the cost of maintaining temporary construction entrance in conformance with the provisions in Section 9-1.03, "Force Account Payment," of the Standard Specifications and paying to the Contractor one-half of that cost.

Cleanup, repair, removal, disposal, or replacement due to improper installation or the Contractor's negligence will not be considered as included in the cost for performing maintenance.

### **10-1.22 MOVE-IN/MOVE-OUT (TEMPORARY EROSION CONTROL)**

#### **GENERAL**

##### **Summary**

This work includes moving onto the project when an area is ready to receive temporary erosion control, setting up required personnel and equipment for the application of erosion control materials, and moving out all personnel and equipment when temporary erosion control in that area is completed.

Temporary erosion control consists of any water pollution control practice for soil stabilization.

When notified by the Engineer that an area is ready for temporary erosion control, start erosion control work within 5 working days.

## **MEASUREMENT AND PAYMENT**

Move-in/move-out (temporary erosion control) is measured as units from actual count. A move-in followed by a move-out is considered one unit.

The contract unit price paid for move-in/move-out (temporary erosion control) includes full compensation for furnishing all labor, materials (excluding temporary erosion control materials), tools, equipment, and incidentals and for doing all the work involved in moving in and removing from the project all personnel and equipment necessary for application of temporary erosion control, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.



## **10-1.23 TEMPORARY DRAINAGE INLET PROTECTION**

### **GENERAL**

#### **Summary**

This work includes constructing, maintaining, and removing temporary drainage inlet protection. Drainage inlet protection settles and filters sediment before stormwater runoff discharges into storm drainage systems.

The SWPPP must describe and include the use of temporary drainage inlet protection as a water pollution control practice for sediment control.

Provide temporary drainage inlet protection to meet the changing conditions around the drainage inlet. Temporary drainage inlet protection must be:

1. Appropriate type to meet the conditions around the drainage inlet
2. Type 1, Type 2, Type 3A, Type 3B, Type 4A, Type 4B, Type 5, Type 6A, Type 6B, or a combination

#### **Submittals**

Submit a Certificate of Compliance as specified in Section 6-1.07, "Certificates of Compliance" of the Standard Specifications for:

1. Erosion control blanket
2. Fiber rolls
3. Safety cap for metal posts
4. Silt fence fabric
5. Sediment filter bag
6. Foam barrier
7. Rigid plastic barrier
8. Gravel-filled bag fabric

If you substitute the steel wire staple with an alternative attachment device, submit a sample of the device for approval at least 5 working days before installation.

### **MATERIALS**

#### **Geosynthetic Fabrics**

Geosynthetic fabrics for temporary drainage inlet protection must consist of one of the following:

1. Polyester
2. Polypropylene
3. Combined polyester and polypropylene

Geosynthetic fabrics must comply with:

#### Water Pollution Control

Property	ASTM Designation	Specification				
Application		Silt Fence		Sediment Filter Bag	Gravel-Filled Bags	Foam Barrier
		Woven	Non-woven			
Grab breaking load 25-mm grip, kilonewtons, min. in each direction	D 4632	0.53	0.53	1.13	0.91	0.89
Apparent elongation percent, min., in each direction	D 4632	15	50	50	50	15
Water Flow Rate max. average roll value, liters per minute per square meter	D 4491	405-2025	4050-6075	3251-8148	3251-6095	4074-6095
Permittivity l/sec., min.	D 4491	0.05	0.05	1.5	1.2	0.05
Apparent opening size max. average roll value, mm	D 4751	0.600	0.600	0.425-0.850	0.850-1.70	0.850
Ultraviolet Degradation percent of original unexposed grab breaking load 500 hr, minimum	D 4595	70				

Sample under ASTM D 4354, Procedure C.

Test under ASTM D 4759. All properties are based on Minimum Average Roll Value (MARV).

Identify, store, and handle under ASTM D 4873.

Protect geosynthetics from moisture, sunlight, and damage during shipping and storage. Label each unit with the manufacturer's name, identifying information and product identification.

#### Erosion Control Blanket

Erosion control blanket must be:

1. Described as a rolled erosion control product (RECP)
2. Classified as temporary and degradable or long-term and non-degradable
3. Machine-made mats
4. Provided in rolled strips
5. Classified by the Erosion Control Technology Council (ECTC)

Erosion control blanket classified as temporary and degradable must be one of the following:

1. Double net excelsior blanket:
  - 1.1. Classified as ECTC Type 2D
  - 1.2. Classified as an erosion control blanket
  - 1.3. Designed to last for at least one year after installation
  - 1.4. With a Universal Soil Loss Equation (USLE) C-Factor of not more than 0.20 at a 1:2 (vertical:horizontal) slope
  - 1.5. With 80 percent of the wood excelsior fibers being 150 mm or longer
  - 1.6. Capable to withstand a maximum shear stress of 84 Pa under ASTM D 6460
  - 1.7. With a minimum tensile strength of 1.09 kN per meter under ASTM D 5035
  - 1.8. With top and bottom surfaces covered with lightweight non-synthetic netting

2. Double net straw and coconut blanket:

- 2.1. Classified as ECTC Type 2D
- 2.2. Classified as an erosion control blanket
- 2.3. Designed to last for at least one year after installation
- 2.4. With a USLE C-Factor of not more than 0.20 at a 1:2 (vertical:horizontal) slope
- 2.5. Comprised of 70 percent straw and 30 percent coconut fiber
- 2.6. Capable to withstand a maximum shear stress of 84 Pa under ASTM D 6460
- 2.7. With a minimum tensile strength of 1.09 kN per meter under ASTM D 5035
- 2.8. With top and bottom surfaces covered with lightweight non-synthetic netting

3. Jute netting:

- 3.1. Classified as ECTC Type 3B
- 3.2. Classified as an open weave textile and have from 14 to 20 strands per 305 mm in each direction
- 3.3. Designed to last for at least one year after installation
- 3.4. With a USLE C-Factor of not more than 0.25 at a 1:1.5 (vertical:horizontal) slope
- 3.5. Comprised of 100 percent unbleached and undyed spun yarn made of jute fiber
- 3.6. With an average open area from 63 to 70 percent
- 3.7. From 1.22 to 1.83 m in width
- 3.8. Capable to withstand a maximum shear stress of 96 Pa under ASTM D 6460
- 3.9. With a minimum tensile strength of 1.45 kN per meter under ASTM D 5035
- 3.10. From 0.34 to 0.45 kg per square meter in weight

4. Coir netting:

- 4.1. Classified as ECTC Type 4
- 4.2. Classified as an open weave textile and from 13 to 18 strands per 305 mm in each direction
- 4.3. Designed to last for at least three years after installation
- 4.4. With a USLE C-Factor of not more than 0.25 at a 1:1 (vertical:horizontal) slope
- 4.5. Comprised of 100 percent unbleached and undyed spun coir yarn made of coconut fiber
- 4.6. With an average open area from 63 to 70 percent
- 4.7. From 1.82 to 4.0 m in width
- 4.8. Capable to withstand a maximum shear stress of 108 Pa under ASTM D6460
- 4.9. With a minimum tensile strength of 1.82 kN per meter under ASTM D 5035
- 4.10. From 0.45 to 0.63 kg per square meter in weight

Erosion control blanket classified as long-term and non-degradable must:

1. Be a geosynthetic fabric
2. Comply with Section 88-1.04, "Rock Slope Protection Fabric," of the Standard Specifications for rock slope protection fabric (Type A)

**Staples**

You may use an alternative attachment device such as a geosynthetic pins or plastic pegs to install erosion control blanket.

**Rock**

Rock must comply with:

1. Requirements under Section 72-2.02, "Materials," of the Standard Specifications
2. Following sizes:

Square Screen Size (mm)	Percentage Passing	Percentage Retained
150	100	0
75	0	100

## **Rope**

Rope for fiber rolls must be:

1. Biodegradable, such as sisal or manila
2. At least 6.35 mm in diameter

## **Fiber Rolls**

Fiber rolls must:

1. Last for at least one year after installation
2. Be Type 1 or Type 2

For Type 1, fiber rolls must be:

1. Made from an erosion control blanket classified as temporary and degradable
2. Rolled along the width
3. Secured with natural fiber twine every 2 m and 150 mm from each end
4. Finished to be either:
  - 4.1. From 200 to 250 mm in diameter, from 3.0 to 6.0 m long, and at least 0.74 kg per meter
  - 4.2. From 250 to 300 mm in diameter, at least 3.0 m long, and at least 2.97 kg per meter

For Type 2, fiber rolls must:

1. Be filled with rice or wheat straw, wood excelsior, or coconut fiber
2. Be covered with biodegradable jute, sisal, or coir fiber netting
3. Have netting secured tightly at each end
4. Be finished to be either:
  - 4.1. From 200 to 250 mm in diameter, from 3.0 to 6.0 m long, and at least 1.63 kg per meter
  - 4.2. From 250 to 300 mm in diameter, at least 3.0 m long, and at least 4.45 kg per meter

## **Wood Stakes**

Wood stakes must be:

1. Untreated fir, redwood, cedar, or pine and cut from sound timber
2. Straight and free of loose or unsound knots and other defects which would render the stakes unfit for use
3. Pointed on the end to be driven into the ground

For fiber rolls, wood stakes must be at least:

1. 25 mm x 25 mm x 600 mm in size for Type 1 installation
2. 25 mm x 25 mm x 600 mm in size for Type 2 installation

## **Posts**

Posts must be wood or metal.

Wood posts must be:

1. Untreated fir, redwood, cedar, or pine and cut from sound timber
2. Straight and free of loose or unsound knots and other defects that would render the stakes unfit for use
3. Pointed on the end to be driven into the ground
4. At least 50 mm x 50 mm in size, and 1.2 m long

Metal posts must:

1. Be made of steel
2. Have a "U," "T," "L," or other cross sectional shape that can resist failure from lateral loads
3. Be pointed on the end to be driven into the ground

4. Weigh at least 1.1 kg/m
5. Be at least 1.2 m long
6. Have a safety cap attached to the exposed end. The safety cap must be orange or red plastic and fit snugly to the metal post

#### **Silt Fence**

Silt fence must be:

1. Constructed with silt fence fabric, posts, and fasteners
2. Prefabricated or assembled at the job site

Silt fence fabric must be attached to posts using these methods:

1. If prefabricated silt fence is used, posts must be inserted into sewn pockets
2. If assembled on the job site:
  - 2.1. If wood posts are used, fasteners must be staples or nails
  - 2.2. If steel posts are used, fasteners must be tie wires or locking plastic fasteners
  - 2.3. Spacing of the fasteners must be at least 200 mm

#### **Gravel-filled Bags**

Gravel-filled bags must:

1. Be made from fabric
2. Have inside dimensions from 600 to 800 mm in length, and from 400 to 500 mm in width
3. Have the opening bound to retain the gravel. The opening must be sewn with yarn, bound with wire, or secured with a closure device
4. Weigh from 13 to 22 kg when filled with gravel

Gravel for gravel-filled bags must be:

1. From 10 to 19 mm in diameter
2. Clean and free from clay balls, organic matter, and other deleterious materials

#### **Sediment Filter Bag**

Sediment filter bag must:

1. Be made of fabric
2. Be sized to fit the catch basin or drainage inlet
3. Include a high-flow bypass

Sediment filter bag may include a metal frame. Sediment filter bags that do not have a metal frame and are deeper than 450 mm must:

1. Include lifting loops and dump straps
2. Include a restraint cord to keep the sides of the bag away from the walls of the catch basin

#### **Foam Barriers**

Foam barriers must:

1. Be filled with a urethane foam core
2. Have a geosynthetic fabric cover and flap
3. Have a triangular, circular, or square shaped cross section
4. Have a vertical height of at least 125 mm after installation
5. Have a horizontal flap of at least 200 mm in width
6. Have a length of at least 1.2 m per unit
7. Have the ability to interlock separate units into a longer barrier so that water does not flow between the units

8. Be secured to:

- 8.1. Pavement with 25 mm concrete nails with 25 mm washers and solvent-free adhesive
- 8.2. Soil with 150 mm nails with 25 mm washers

**Rigid Plastic Barriers**

Rigid plastic barriers must:

- 1. Have an integrated filter
- 2. Have a formed outer jacket of perforated high density polyethylene (HDPE) or polyethylene terephthalate (PET)
- 3. Have a flattened tubular shaped cross section
- 4. Be made from virgin or recycled materials
- 5. Be free from biodegradable filler materials that degrade the physical or chemical characteristics of the finished filter core or outer jacket
- 6. Have a length of at least 1.2 m per unit
- 7. Have the ability to interlock separate units into a longer barrier so that water does not flow between the units
- 8. Be secured to:
  - 8.1 Pavement with 25 mm concrete nails with 25 mm washers and solvent-free adhesive, with gravel-filled bags, or a combination
  - 8.2 Soil with 150 mm nails with 25 mm washers and wood stakes

9. Comply with the following properties:

Specification	Requirements
Grab tensile strength of outer jacket material, kPa, min. in each direction ASTM D 4632*	27600
Break strength of outer jacket, kPa, ASTM D 4632*	8960
Permittivity of filter core, l/sec., min. ASTM D 4491	0.38
Flow rate of filter core, liters/square meter per second ASTM D 4491	67.8 min. 135.6 max.
Filter core aperture size, max., Average Opening Size (AOS), mm	0.43
Ultraviolet stability (outer jacket & filter core), percent tensile strength retained after 500 hours, min. ASTM D 4355 (xenon-arc lamp and water spray weathering method)	90

\* or appropriate test method for specific polymer

If used at a curb inlet without a grate, rigid plastic barriers must:

- 1. Have a horizontal flap of at least 150 mm with an under-seal gasket to prevent underflows
- 2. Include a high-flow bypass
- 3. Have a vertical height of at least 175 mm after installation
- 4. Be sized to fit the catch basin or drainage inlet

If used at a grated catch basin without a curb inlet, rigid plastic barriers must:

- 1. Cover the grate by at least 50 mm on each side and have an under-seal gasket to prevent underflows
- 2. Include a high-flow bypass
- 3. Have a vertical height of at least 38 mm after installation
- 4. Be sized to fit the catch basin or drainage inlet

If used at a curb inlet with a grate, rigid plastic barriers must:

1. Have a horizontal flap that covers the grate by at least 50 mm on the 3 sides away from the curb opening and have an under-seal gasket to prevent underflows
2. Include a high-flow bypass
3. Have a vertical section that covers the curb opening by at least 125 mm after installation
4. Be sized to fit the catch basin or drainage inlet

If used as a linear sediment barrier, rigid plastic barriers:

1. Must have an installed height of at least 150 mm
2. May have a horizontal flap of at least 100 mm

#### **Linear Sediment Barrier**

Linear sediment barriers must consist of one or more of the following:

1. Silt fence
2. Gravel-filled bags
3. Fiber roll
4. Rigid plastic barrier
5. Foam barrier

#### **Flexible Sediment Barrier**

Flexible sediment barriers consist of one or more of the following:

1. Rigid plastic barrier
2. Foam barrier

### **CONSTRUCTION**

For drainage inlet protection at drainage inlets in paved and unpaved areas:

1. Prevent ponded runoff from encroaching on the traveled way or overtopping the curb or dike. Use linear sediment barriers to redirect runoff and control ponding
2. Clear the area around each drainage inlet of obstructions including rocks, clods, and debris greater than 25 mm in diameter before installing the drainage inlet protection
3. Install a linear sediment barrier up-slope of the existing drainage inlet and parallel with the curb, dike, or flow line to prevent sediment from entering the drainage inlet

#### **Erosion Control Blanket**

To install erosion control blanket and geosynthetic fabric:

1. Secure blanket or fabric to the surface of the excavated sediment trap with staples and embed in a trench adjacent to the drainage inlet
2. Anchor the perimeter edge of the erosion control blanket in a trench

#### **Silt Fence**

If silt fence is used as a linear sediment barrier:

1. Place fence along the perimeter of the erosion control blanket, with the posts facing the drainage inlet
2. Install fence with the bottom edge of the silt fence fabric in a trench. Backfill the trench with soil and compact manually

#### **Gravel Bag Berm**

If gravel bag berm is used as a linear sediment barrier:

1. Place gravel-filled bags end-to-end to eliminate gaps
2. Stack bags in a way that the bags in the top row overlap the joints in the lower row

If gravel bag berms are used for Type 3A and Type 3B:

1. Place gravel-filled bags end-to-end to eliminate gaps
2. Stack bags in a way that the bags in the top row overlap the joints in the lower row
3. Arrange bags to create a spillway by removing one or more gravel-filled bags from the upper layer

If used within shoulder area, place gravel-filled bags behind temporary railing (Type K).

#### **Fiber Rolls**

If fiber rolls are used as a linear sediment barrier:

1. Place fiber rolls in a furrow
2. Secure fiber rolls with stakes installed along the length of the fiber rolls. Stakes must be installed from 150 to 300 mm from the end of the rolls

If fiber rolls are used as a linear sediment barrier for Type 4A, place them over the erosion control blanket.

#### **Foam Barriers**

If foam barriers are used as a linear sediment barrier:

1. Install barriers with the horizontal flap in a 75 mm deep trench and secured with nails and washers placed no more than 1.2 m apart
2. Secure barriers with 2 nails at the connection points where separate units overlap
3. Place barriers without nails or stakes piercing the core

#### **Flexible Sediment Barriers**

If flexible sediment barriers are used:

1. Secure barriers to the pavement with nails and adhesive, gravel-filled bags, or a combination
2. Install barriers flush against the sides of concrete, asphalt concrete, or hot mix asphalt curbs or dikes
3. Place barriers to provide a tight joint with the curb or dike and anchored in a way that runoff cannot flow behind the barrier

If flexible sediment barriers are used for Type 4B:

1. Secure barriers to the pavement according to the angle and spacing shown on the plans
2. Place barriers to provide a tight joint with the curb or dike. Cut the cover fabric or jacket to ensure a tight fit

#### **Rigid Sediment Barriers**

If rigid sediment barriers are used at a grated catch basin without a curb inlet:

1. Place barriers using the gasket to prevent runoff from flowing under the barrier
2. Secure barriers to the pavement with nails and adhesive, gravel-filled bags, or a combination

If rigid sediment barriers are used for linear sediment barriers:

1. Install barriers in a trench. Backfill the trench with soil and compact manually
2. Place barrier with separate units overlapping at least 100 mm
3. Reinforce barriers with a wood stake at each overlap
4. Fasten barriers to the wood stakes with steel screws, 1.57 mm galvanized steel wire, or with UV stabilized cable ties that are from 125 to 175 mm in length

#### **Sediment Filter Bags**

Install sediment filter bags for Type 5 by:

1. Removing the drainage inlet grate



2. Placing the sediment bag in the opening
3. Replacing the grate to secure the sediment filter bag in place

## **MAINTENANCE**

Maintain temporary drainage inlet protection to provide sediment holding capacity and to reduce runoff velocities.

Remove sediment deposits, trash, and debris from temporary drainage inlet protection as needed or when directed by the Engineer. If removed sediment is deposited within project limits, it must be stabilized and not subject to erosion by wind or water. Trash and debris must be removed and disposed of as specified in Section 7-1.13, "Disposal of Material Outside the Highway Right of Way," of the Standard Specifications.

Maintain temporary drainage inlet protection by removing sediment from:

1. Behind flexible sediment barriers when sediment exceeds 25 mm in depth
2. Surface of the erosion control blanket when sediment exceeds 25 mm in depth
3. Sediment trap for Type 2 when the volume has been reduced by approximately one-half
4. Behind silt fence when the sediment is 1/3 the height of the silt fence fabric above ground
5. Sediment filter bags when filled or when the restraint cords are no longer visible

If rills and other evidence of concentrated runoff occur beneath the linear sediment barrier, repair or adjust the barrier.

If silt fence fabric becomes split, torn, or unraveled, repair or replace silt fence.

If geosynthetic fabric becomes split, torn, or unraveled, repair or replace foam barriers.

Repair or replace sagging or slumping linear sediment barriers with additional stakes. Replace broken or split wood stakes.

Reattach foam barriers and rigid plastic barriers that become detached or dislodged from the pavement.

Repair split or torn rigid plastic barriers with 1.29 mm galvanized steel wire or UV stabilized cable ties that are from 125 to 175 mm in length.

For sediment filter bags without metal frames, empty by placing 25 mm steel reinforcing bars through the lifting loops and then lift the filled bag from the drainage inlet. For sediment filter bags with metal frames, empty by lifting the metal frame from the drainage inlet. Rinse before replacing in the drainage inlet. When rinsing the sediment filter bags, do not allow the rinse water to enter a drain inlet or waterway.

Repair temporary drainage inlet protection within 24 hours of discovering damage unless the Engineer approves a longer period.

If your vehicles, equipment, or activities disturb or displace temporary drainage inlet protection, repair temporary drainage inlet protection at your expense.

The Department does not pay maintenance costs for cleanup, repair, removal, disposal, or replacement due to improper installation or your negligence.

## **REMOVAL**

When the Engineer determines that the temporary drainage inlet protection is not required, it must be removed and disposed of under Section 7-1.13, "Disposal of Material Outside the Highway Right of Way," of the Standard Specifications.

Ground disturbance, including holes and depressions, caused by the installation and removal of the temporary drainage inlet protection must be backfilled and repaired under Section 15-1.02, "Preservation of Property," of the Standard Specifications.

## **MEASUREMENT AND PAYMENT**

Quantities of temporary drainage inlet protection will be determined from actual count in place. The protection will be measured one time only and no additional measurement will be recognized.

The contract unit price paid for temporary drainage inlet protection includes full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in constructing the temporary drainage inlet protection, complete in place, including removal of materials, cleanup and disposal of retained sediment and debris, and backfilling and repairing holes, depressions and other ground disturbance, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

No additional compensation will be made if the temporary drainage inlet protection is relocated during the course of construction.

The State and you share the cost of maintaining the temporary drainage inlet protection. The State determines the maintenance cost under Section 9-1.03, "Force Account Payment," of the Standard Specifications and pays you one-half of that cost.

#### **10-1.24 ESTABLISH MARINE ACCESS**

##### **GENERAL**

This work shall consist of furnishing, erecting, maintaining and removing barges, trestles and other facilities to establish marine access to the job site. This work shall be separate from and in addition to the work specified in Section 11, "Mobilization," of the Standard Specifications.

Marine access may be established to provide access to the jobsite. It must be within the limits as shown on the plans, and must comply with the permits, licenses, agreements, and certifications as specified in "Permits, Licenses, Agreements, and Certifications," and "Species Protection," of these special provisions.

##### **SUBMITTALS**

The Contractor shall submit to the Engineer working drawings and design calculations of any access trestle and other temporary facilities, in accordance with the provisions in "Working Drawings," of these special provisions. All design calculations shall be independently checked by a registered Civil Engineer in conformance with the provisions in "Working Drawings" of these special provisions. The Contractor shall allow 30 days for the Engineer's review and comment. The Engineer's approval will not be required for working drawings of temporary access facilities.

Within 45 days after contract approval, the Contractor shall submit to the Engineer a plan for marine pile installation. Plan shall include the schedule and methods for pile installation in compliance with project permits included in the Project Information handout. The Contractor shall allow 30 days for the Engineer's review and comment. The Engineer's approval will not be required for marine pile installation plan.

The Contractor shall submit, for approval by the Engineer, a schedule of values detailing the cost breakdown of the contract lump sum price for establish marine access. The schedule of values shall reflect the items, work, quantities and costs required to establish marine access to the job site, including as a minimum the initial mobilization of marine access facilities, monthly facility and equipment rental, monthly maintenance, and demobilization. The Contractor shall be responsible for the accuracy of the quantities and costs used in the schedule of values submitted for approval.

The sum of the amounts for the items and work listed in the schedule of values shall be equal to the contract lump sum price for establish marine access.

When approved in writing by the Engineer, the schedule of values will be used to determine progress payments for establish marine access during the progress of the work. No partial payment for establish marine access will be made until the schedule of values is approved in writing by the Engineer.

##### **CONSTRUCTION**

Attention is directed to "Marine Pile Driving Energy Attenuator," of these special provisions.

The Contractor must use hollow steel shell piles less than or equal to 914 mm diameter, or H-piles, or timber piles.

Vibratory hammer shall be used to install all steel shell piles the majority of the total pile length (greater than 50% of the pile length).

Should steel shell piles be entirely installed with a vibratory hammer (100% of the pile length), the piles may be proof tested with an impact hammer. A maximum of 10% of the piles installed completely with a vibratory hammer may be proof tested with an impact hammer, without the use of a marine pile driving energy attenuator.

No more than two piles per day may be proof tested with an impact hammer. Pile proof testing will be limited to less than 1 minute per pile, administering a maximum of twenty blows per pile.

All impact pile driving will be restricted to the period between June 1<sup>st</sup> and November 30<sup>th</sup>, with the exception of pile proof testing.

A sound attenuation system shall be used during all impact driving of steel shell piles, with the exception of pile proof testing.

A maximum of 20 hollow steel shell piles or 10 H-piles may be installed per day with the use of an impact hammer.

Underwater sound levels shall not exceed 206 dB<sub>peak</sub> referenced to 1 micro Pascal (re: 1μ Pa), at a distance greater than 10 meters from the pile being impact driven or proof tested, 187 dB cumulative sound exposure level (SEL) re: 1 microPa, at a distance greater than 34 meters from the pile being impact driven or 19 meters from the pile being proof tested, or 190 dB root-mean-square (RMS) re: 1 microPa at distances greater than 10 meters from the pile being impact driven or proof tested.

The Contractor shall coordinate with the Department to allow for all biological monitoring to be performed by the Department as required by regulatory agencies. The Contractor shall provide sufficient notice prior to pile installation activities as requested by the Engineer. Sufficient notice shall include a least 7 days notice prior to the commencement of pile installation episodes, and one day notice of the estimated time for the following day's pile installation activity. The Contractor shall provide biological monitors safe access to all required work areas.

The Contractor shall stop or delay pile installation activities when directed by the Engineer as determined by the Department's biological monitors. The determination will be based on regulatory agency requirements to protect fish and marine mammals, or if the Department's monitors determine that the sound attenuation system is not effectively reducing sound levels to within the permit parameters, defined above. Marine mammals shall be allowed to leave by their own volition prior to commencing or resuming pile installation activities as directed by the Engineer, as determined by the biological monitors.

Pile driving shall occur only during daylight hours from between 7:00 a.m. and 7:00 p.m. The Contractor shall prevent light from pile driving operations from shining directly into the water.

If turbidity levels approach or exceed the maximum levels allowed as specified in "Turbidity Control," of these special provisions, the Contractor must cease pile installation or removal activities until the turbidity returns to permissible levels.

## **REMOVAL**

When no longer required, marine access facilities must be completely removed. Removed materials shall become the property of the Contractor and shall be disposed of in conformance with the provisions in Section 7-1.13, "Disposal of Material Outside the Highway Right of Way," of the Standard Specifications.

## **PAYMENT**

The contract lump sum price paid for establish marine access shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in designing, constructing, maintaining, and removing marine access facilities, complete in place, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

Full compensation for pile proof testing shall be considered as included in the contract lump sum price paid for establish marine access and no separate payment will be made therefor.

The adjustment provisions in Section 4-1.03, "Changes," of the Standard Specifications shall not apply to the contract lump sum price for establish marine access. Full compensation for damages due to delays shall be considered as included in the payments made in accordance with "Time-Related Overhead" of these special provisions and Section 8-1.09, "Right of Way Delays," of the Standard Specifications and no additional compensation will be allowed therefor.

## **10-1.25 MARINE PILE DRIVING ENERGY ATTENUATOR**

This work shall consist of designing, furnishing, installing, operating, monitoring, maintaining, and removing an air bubble curtain system to attenuate underwater energy generated by driving steel shell piles. For purposes of this specification, pile installation refers to all the activities involved with driving a single pile; pile driving refers to the time when the hammer is physically driving the pile.

Attention is directed to "Relations with United States Coast Guard," of these special provisions regarding navigation requirements.

Attention is directed to "Permits, Licenses, Agreements, and Certifications," "Species Protection," and "Bird Protection," of these special provisions.

The approved attenuator system shall be operating prior to beginning pile driving at any given pile location. If the attenuator fails, as determined by the Engineer, pile driving shall immediately stop. Piling driving at any given location shall not resume until the attenuator system at that location is again operating in conformance with the requirements of this section, as determined by the Engineer.

Failure of the attenuator system shall include, but not be limited to, the following methods of failure as determined by the Engineer:

1. The pressure or flow rate in any meter falls below 90% of its operating value during the pile driving operation;
2. During inspection of the perforated pipe the Engineer determines that erosion of the holes or debris has clogged the holes that will degrade the performance of the system.
3. The bottom ring is not in contact with the bay bottom.

The Contractor shall make provisions for the Engineer to inspect the bubble curtain system for proper operation before each deployment and as necessary during deployment. Proper operation during deployment will be determined by observation of the gauges in the monitoring station and by other methods developed by the Engineer.

At the Contractor's option, cofferdams that conform to the following requirements may be used as a marine pile driving energy attenuator:

1. Cofferdams shall be continuous (no openings in the sides).
2. Cofferdams shall be made of concrete or steel members.
3. Cofferdams shall extend from Mean Higher High Water to at least 0.5 meters below the original mudline.
4. Cofferdams shall be dewatered prior to pile driving.

The Contractor shall provide adequate means to prevent light from pile driving operations from shining directly into the water. At least 15 minutes prior to and during pile driving operations, the Contractor shall not shine light directly into the water in areas adjacent to piles being driven.

#### GENERAL

An air bubble curtain system is generally composed of an air compressor(s), supply lines to deliver the air, distribution manifolds or headers, perforated aeration pipes, and a frame. The frame facilitates transport and placement of the system, keeps the aeration pipes stable, and provides ballast to counteract the buoyancy of the aeration pipes in operation.

Air bubble curtain system shall conform to the following:

1. Air bubble system shall consist of multiple and concentric layers of perforated aeration pipes stacked vertically in accordance with the following:

Water Depth (m)	No. of Layers
0 to less than 5	2
5 to less than 10	4
10 to less than 15	7
15 to less than 20	10
20 to less than 25	13

2. Pipes in any layer shall be arranged in a geometric pattern, which shall allow for the pile driving operation to be completely enclosed by bubbles for the full depth of the water column and for a radial dimension of no more than 0.5 meters as measured from the outside surface of the pile.
3. The lowest layer of perforated aeration pipes shall be designed to ensure contact with the mudline without sinking into the bay mud.
4. The system shall provide a bubble flux of 2.0 cubic meters per minute per linear meter of pipe in each layer. Air holes shall be 1.6 mm in diameter and shall be spaced approximately 20 mm apart. Air holes shall be placed in four adjacent rows along the pipe to provide uniform bubble flux.
5. Air compressors used over water shall be oil free.
6. Meters shall be provided in accordance with the following:
  - 6.1. Pressure meters shall be installed at all inlets to aeration pipelines and at points of lowest pressure in each branch of the aeration pipeline.
  - 6.2. Flow meters shall be installed in the main line at each compressor and at each branch of the aeration pipelines at each inlet. In applications where the feedline from the compressor is continuous from the compressor to the aeration pipe inlet the flow meter at the compressor can be eliminated.
  - 6.3. Flow meters shall be installed according to the manufacturer's recommendation based on either laminar flow or non-laminar flow, whichever applies.

Gauges shall be installed above the water line and shall be easily accessible to the Engineer. The Contractor shall keep a continuous electronic log of all meters and gauges when the system is operating. Readings shall be logged every 30 minutes and at other times, as determined by the Engineer, when variation in the readings exceed 10%. The Contractor shall maintain a graphical plot showing the variation of the meter readings with time.

Air pressure and air flow meters and gauges shall be calibrated by a private laboratory approved by the Engineer prior to use in the attenuator system. Meters shall be accurate to within 2 percent.

The Contractor shall monitor the condition of the attenuator system and prepare inspection reports daily during pile installation operations and no less than every other day during periods of no activity.

The Contractor's design, installation, maintenance, monitoring, operation and removal of the attenuator system shall take into account the site conditions and the requirements of pile installation. Factors to be taken into account include anchoring, moving, and dismantling the system; configuration of bay bottom; water velocity; water-surface conditions; air and water temperatures; and positioning of pile and pile-driving equipment relative to the bubble curtain system.

Water velocity at the site is expected to vary from zero to 2 knots and vary in direction due to changes in tidal flow. The design of the system shall ensure that the system extends from bay bottom to the water surface during maximum water-current conditions and accommodates tidal changes.

The pile-driving barge shall be isolated from the noise-producing operations. This isolation shall be such that noise from the pile driving operation is not transmitted through the barge to the water column. The barge deploying or containing the pile-driving equipment is not required to be contained within the system.

The Contractor shall completely remove the attenuator system at the completion of the project and the system will remain the property of the Contractor.

### **WORKING DRAWINGS**

The Contractor shall submit working drawings with supplement for the attenuator system to the Engineer for approval in conformance with the provisions in "Working Drawings," of these special provisions, except as otherwise noted.

Working drawings with supplement shall be signed by a Mechanical Engineer who is registered in the State of California. Working drawings shall include the following:

1. Complete details of the system including mechanical and structural details.
2. Details of anchorage components, air compressors, supply lines, distribution manifolds, aeration pipes and frame.
3. Details of proposed means of isolating noise-producing systems on the pile-driving barge.
4. Details of meters, gauges, and recording devices.
5. Description of measures taken to avoid shining light into the water during pile driving operations.
6. Details of the manufacturer's recommendations for installation of the flow meters in conditions of laminar flow and non-laminar flow.

The supplement to the working drawing shall include the following:

1. Independently checked design calculations.
2. Materials list including the name of the manufacturer and the source, model number, description, and standard of manufacture.
3. Manufacturer's descriptive data and catalog cuts for all products proposed for the system including air compressors.
4. Calculations showing pressure loss in the piping system and estimated flows from the most removed orifice of the aeration piping.

Within 60 working days after the approval of the contract, the Contractor shall submit working drawings, with supplements, to the Engineer. The Contractor shall allow the Engineer 20 working days to review the working drawings. If revisions are required, as determined by the Engineer, the Contractor shall revise and resubmit the working drawings within 15 working days of receipt of the Engineer's comments. The Contractor shall allow the Engineer 10 working days to review the revised working drawings.

The Contractor shall submit inspection reports in conformance with "Working Drawings," of these special provisions within 48 hours following inspection.

Full compensation for marine pile driving energy attenuator including designing, maintaining, monitoring, recording, and removing the attenuator system, as specified in these special provisions shall be considered as included in the contract lump sum price paid for the item of work requiring marine pile driving energy attenuator and no additional compensation will be allowed therefor.

Full compensation for inspections and monitoring of the attenuator system and isolation of pile-driving barge from pile installation noise shall be considered as included in the contract lump sum price paid for the item of work requiring marine pile driving energy attenuator and no additional compensation will be allowed therefor.

If the Contractor elects to use cofferdams for the marine pile driving energy attenuator, no additional compensation will be allowed and no extension of time will be granted for use of this option.

### **10-1.26 SHORING TOWERS**

Shoring towers for the YBI edge beam support structure shall be designed, constructed, maintained and removed in conformance with the details shown on the plans, the requirements in Section 51-1.06, "Falsework," of the Standard Specifications and these special provisions.

Shoring towers shall include all assemblies and appurtenant items necessary to jack and support the structure.

Attention is directed to the sections "Order of Work" and "Maintaining Traffic" of these special provisions.

Approval by the Engineer of the shoring tower working drawings will in no way relieve the Contractor of full responsibility for the shoring towers.

### **WORKING DRAWINGS**

The Contractor shall submit to the Engineer working drawings and design calculations for the shoring towers. Such drawings and design calculations shall be signed by an engineer who is registered as a Civil Engineer in the State of California. The shoring tower working drawings and design calculations shall conform to the requirements in "Working Drawings," of these special provisions. The number of sets of drawings and design calculations and times for review for shoring towers shall be the same as specified for falsework working drawings in Section 51-1.06A, "Falsework Design and Drawings," of the Standard Specifications.

The shoring tower working drawings shall include descriptions and values of all loads, a summary of computed stresses, descriptions of equipment to be used, erection methods and removal plans and complete details and calculations for jacking and shimming the existing structure.

When footing type foundations are to be used, the Contractor shall determine the bearing value of the soil and shall show the values assumed in the design of the shoring towers on the shoring tower drawings. Anticipated shoring tower foundation settlement shall be shown on the shoring tower drawings.

### **SHORING TOWER DESIGN**

The shoring towers shall be designed to minimize the live load deflection of the YBI South Edge Beam. Pre-loading of the shoring tower is required to remove initial settlement and seat the spread footing. After initial settlement has been removed, the shoring tower shall be capable of carrying a 450 kN axial load with no more than 3 mm of deflection. The total load capacity of the shoring tower shall be a minimum of 1320 kN.

### **MANUFACTURED ASSEMBLIES**

Manufactured assemblies shall conform to the provisions in Section 51-1.06A(2) "Design Stresses, Loadings, and Deflections," of the Standard Specifications and these special provisions.

All jacks shall be equipped with a load cell for determining the jacking force. Pressure gages shall have an accurately reading dial at least 150 mm in diameter. Each jack shall be calibrated by a private laboratory approved by the Transportation Laboratory within 6 months prior to use and after each repair, unless otherwise directed. Each jack and its gage shall be calibrated as a unit with the cylinder extension in the approximate position that it will be at final jacking force and shall be accompanied by a certified calibration chart. Load cells shall be calibrated and provided with an indicator by which the jacking force is determined.

Jacks for shoring towers shall be load-rated for at least 125% of the design service loads.

### **CONSTRUCTION**

The construction of shoring towers at each location shall not begin until the Engineer has reviewed and approved the drawings for that location.

Prior to jacking, an engineer for the Contractor who is registered as a Civil Engineer in the State of California shall inspect the shoring towers including jacking systems, for conformity with the working drawings. The Contractor's registered engineer shall certify in writing that the shoring towers, including jacking, conform to the working drawings, and that the material and workmanship are satisfactory for the purpose intended. A copy of this certification shall be available at the site of the work at all times.

The Contractor's registered engineer shall be present at the bridge site at all times when jacking operations or adjustments are in progress.

#### **Pre-Loading of Shoring Towers**

A force of 900 kN shall be jacked onto the shoring tower and held for at least 24 hours or until all initial compression and settlement have occurred. During this period, the jacks shall be monitored and adjusted to ensure the jacking load remains constant. Prior to placing the shim plates, the Contractor shall reduce the jacking force on the shoring tower to 90 kN. The Contractor shall monitor the shims daily until load transfer is completed to ensure

snugness for the duration of the reconstruction work. If a gap develops between the shims and the edge beam, the Contractor shall place additional shims snug tight to fill the gap.

Adequate means shall be employed to prevent unplanned lateral and longitudinal movement of the shoring tower during jacking and shimming operations. The jacking and support system and the superstructure shall be stable during all phases of the operation.

Should unanticipated displacements, cracking or other damage occur, the operation shall be discontinued until corrective measures satisfactory to the Engineer are performed. Damage to the structure as a result of the Contractor's operations shall be repaired by the Contractor in conformance with the provisions in Section 7-1.11, "Preservation of Property," of the Standard Specifications.

When no longer required, shoring towers and associated jacking assemblies shall be completely removed, unless otherwise directed by the Engineer. Shoring tower foundation shall be removed at least 1.0 meter below the original ground.

## **PAYMENT**

The contract lump sum price paid for shoring towers, shall include full compensation for furnishing all labor, materials, tools, equipment and incidentals, and for doing all the work involved in shoring towers, including jacking and shimming the existing structure and removing the shoring towers, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

### **10-1.27 TEMPORARY SUPPORTS (CANTILEVER TRUSS)**

Temporary supports for existing structure during bridge removal work shall be designed, furnished, constructed, monitored, maintained, and removed in conformance with the provisions in these special provisions.

Temporary supports shall be steel bolted braced frames.

Attention is directed to "Relations to United States Coast Guard," of these special provisions.

Attention is directed to "Permits, Licenses, Agreements, and Certifications," "Species Protection," and "Bird Protection," of these special provisions.

Attention is directed to "Bridge Removal, Portion (Cantilever Truss)," of these special provisions.

Attention is directed to "Marine Pile Driving Energy Attenuator," of these special provisions.

Attention is directed to "Turbidity Control" of these special provisions.

Temporary supports shall include jacking assemblies and appurtenant items necessary to jack and support the structures if required by the Contractor's bridge removal plan.

Attention is directed to the sections "Order of Work" of these special provisions.

## **TEMPORARY SUPPORT DESIGN AND DRAWINGS**

The Contractor shall submit to the Engineer working drawings and design calculations for the temporary supports. Such drawings and design calculations shall be stamped and signed by an engineer who is registered as a Civil Engineer in California. The Engineer shall have at least 10 years experience as a registered Civil Engineer and shall have prepared demolition plans for at least one large, continuous steel truss bridge. The temporary support working drawings and design calculations shall conform to the requirements in "Working Drawings" of these special provisions except that the Engineer's approval is not required. The working drawings shall be independently checked, stamped and signed by another registered Civil Engineer with similar experience and qualifications. The independent check shall include all analysis and calculations necessary to independently check temporary support working drawings. The check engineer shall not be an employee of the Contractor and shall be employed by an independent firm. Independent check calculations shall be submitted with the working drawings.

The Contractor's registered engineer and the check engineer shall provide certification that the working drawings comply with all contract requirements and are adequate for the purpose intended. The Contractor shall allow 60 days for the Engineer's review and comment.

Working drawings for any part of the temporary supports shall include stress sheets, anchor bolt layouts, shop details, and erection and removal plans.

The temporary support working drawings shall include descriptions and values of all loads, including construction equipment loads, descriptions of equipment to be used, complete details and calculations for jacking and supporting the existing structure, and descriptions of the displacement monitoring system. The displacement monitoring system shall include equipment to be used, location of control points, method and schedule of taking measurements, and shall also include provisions to jack the structure should settlement occur in the temporary supports.

A redundant system of supports shall be provided during the entire jacking operation for backup should any of the jacks fail. The redundant system shall include stacks of steel plates added as necessary to maintain the redundant supports at each jack location within 6 mm of the jacking sill or corbels.

When footing type foundations are to be used, the Contractor shall determine the bearing value of the soil and shall show the values assumed in the design of the temporary supports on the temporary support drawings. Anticipated temporary support foundation settlement shall be shown on the temporary support drawings.

When pile type foundations are to be used, the temporary support drawings shall include pile details and show the maximum horizontal distance that the top of a temporary support pile may be pulled in order to position it under its cap. The temporary support plans shall also show the maximum allowed deviation of the top of the pile, in its final position, from a vertical line through the point of fixity of the pile. Piling shall conform to the provisions for piling in "Establish Marine Access" of the special provisions.

Temporary support footings shall be designed to carry the load imposed upon them without exceeding the estimated soil bearing values and anticipated settlements.

Bracing shall be provided, as necessary, to withstand all imposed loads during bridge demolition and erection and removal of any temporary supports. The temporary support drawings shall show provisions for such temporary bracing or methods to be used to conform to these requirements during each phase of erection and removal. Wind loads shall be included in the design of such bracing or methods. Wind loads shall be as shown on the plans.

The temporary support design calculations shall show a summary of computed stresses in the (1) temporary supports, (2) connections between temporary supports and the existing structure and (3) existing load supporting members. The computed stresses shall include the effect of the jacking sequence. The temporary support design calculations shall also include a lateral stiffness assessment of the temporary support system.

The design of temporary supports shall be based on the use of loads and conditions which are no less severe than those described in "Temporary Support Design Criteria," of these special provisions and on the use of allowable stresses which are no greater than those described in Section 51-1.06A(2), "Design Stresses, Loadings, and Deflections," of the Standard Specifications and these special provisions.

If falsework loads are imposed on temporary supports, the temporary supports shall also satisfy the deflection criteria described in Section 51-1.06A(2), "Design Stresses, Loadings, and Deflections," of the Standard Specifications.

## **TEMPORARY SUPPORT DESIGN CRITERIA**

The temporary supports shall conform to the requirements of "Manufactured Assemblies" specified herein and shall support the initial jacking loads, if required by the Contractor's bridge removal plan, and the minimum temporary support design loads determined by the Contractor. The vertical design loads shall be adjusted for the weight of temporary supports and jacks, construction equipment loads and additional loads imposed by the Contractor's operations. The construction equipment loads shall be the actual weight of the construction equipment but in no case shall be less than  $960 \text{ N/m}^2$  of deck surface area of the frame involved. A frame is defined as the portion of the bridge between expansion joints.

The temporary supports shall be mechanically connected to their foundations. The mechanical connections shall be designed to tolerate adjustments to the temporary support frame throughout the use of the temporary supports.

### **Manufactured Assemblies**

Manufactured assemblies shall conform to the provisions in Section 51-1.06A(2), "Design Stresses, Loadings, and Deflections," of the Standard Specifications and these special provisions.

Each jack shall be equipped with either a pressure gage or a load cell for determining the jacking force. Pressure gages shall have an accurately reading dial at least 150 mm in diameter. Each jack shall be calibrated by a private laboratory approved by the Transportation Laboratory within 6 months prior to use and after each repair. Each jack and its gage shall be calibrated as a unit with the cylinder extension in the approximate position that it will be at final jacking force and shall be accompanied by a certified calibration chart. Load cells shall be calibrated and provided with an indicator by which the jacking force is determined.

## **SPECIAL LOCATIONS**

Attention is directed to Section 51-1.06A(3), "Special Locations," of the Standard Specifications. All reference to falsework in this section shall also apply to temporary supports.

## **TEMPORARY SUPPORT CONSTRUCTION**

Attention is directed to paragraphs 1 through 7 of Section 51-1.06B, "Falsework Construction," of the Standard Specifications. All reference to falsework in these paragraphs shall also apply to temporary supports.

Welding, welder qualification, and inspection of welding for all steel members shall conform to the requirements of ANSI/AASHTO/AWS D1.1 and to "Falsework" of these special provisions.



Prior to proceeding with bridge removal, an engineer for the Contractor who is registered as a Civil Engineer in the State of California shall inspect the temporary supports, including jacking and displacement monitoring systems, for conformity with the working drawings. The Contractor's registered engineer shall certify in writing that the temporary supports, including jacking and displacement monitoring systems, conform to the working drawings, and that the material and workmanship are satisfactory for the purpose intended. A copy of this certification shall be available at the site of the work at all times.

The Contractor's registered engineer shall be present at the bridge site at all times when jacking operations or adjustments are in progress and when bridge removal operations are in progress. The Contractor's registered engineer shall inspect the jacking and removal operation and report in writing on a daily basis the progress of the operation and the status of the remaining structure. A copy of the daily report shall be furnished to the Engineer on a weekly basis and shall be available at the site of the work at all times. Should an unplanned event occur, the Contractor's registered engineer shall submit immediately to the Engineer for approval, the procedure or proposed operation to correct or remedy the occurrence.

The Contractor shall perform an initial survey as part of the displacement monitoring system to record the location of the existing structure prior to the commencement of any work. Two copies of the survey shall be signed by an engineer, who is registered as a Civil Engineer in the State of California, and submitted to the Engineer.

Vandal-resistant displacement monitoring equipment shall be provided and maintained. Vertical and horizontal displacements of the temporary supports and the existing structure shall be monitored continuously during jacking operations and shall be accurately measured and recorded daily for a week after load transfer and weekly thereafter during removal work. As a minimum, elevations shall be taken prior to the start of jacking operations and immediately after jacking is complete. As a minimum, the existing structure shall be monitored at the piers, at mid span and the ends of cantilevers. Control points at each location shall be located near the center and at both edges of the superstructure. The records of vertical and horizontal displacement shall be signed by an engineer who is registered as a Civil Engineer in the State of California and available to the Engineer at the jobsite during normal working hours, and a copy of the record shall be delivered to the Engineer at the completion of each work day.

A force equal to the dead load shall be applied to the structure by the temporary support system and held until all initial compression and settlement of the system is completed before bridge removal work at the location being supported is begun.

Jacking operations shall be carefully controlled and monitored to ensure that the jacking loads are applied simultaneously to prevent distortion and excessive stresses that would cause instability in the structure being removed.

Should unanticipated displacements, or instability in the structure occur, bridge removal operations shall be discontinued until corrective measures satisfactory to the Engineer are performed.

### **REMOVING TEMPORARY SUPPORTS**

Attention is directed to Section 51-1.06C, "Removing Falsework," of the Standard Specifications. All references to falsework in this section shall also apply to temporary supports.

Full compensation for designing, constructing, maintaining, and removing the temporary supports, including jacking the existing structure and monitoring displacements as specified herein, shall be considered as included in the contract lump sum price paid for Bridge Removal (Portion) Location E and no separate payment will be made therefore.

### **10-1.28 SCAFFOLDING**

Scaffolding shall be defined in accordance with and shall conform to the Construction Safety Orders of the Division of Occupational Safety and Health and these special provisions.

If scaffolding is constructed for this project over or adjacent to traffic, or suspended from the traveled way, the Contractor shall submit to the Engineer working drawings for scaffolding systems in conformance with Section 5-1.02, "Plans and Working Drawings" of the Standard Specifications, and these special provisions.

Scaffolding working drawings shall include the following:

- A. Descriptions, calculations, and values for all loads anticipated during the erection, use, and removal of scaffolding.
- B. Methods and equipment for erecting, moving, and removing scaffolding.
- C. Design details including bolt layouts, welding details, and any connections to existing structures.
- D. Stress sheets including a summary of computed stresses in the (1) scaffolding, (2) connections between scaffolding and any existing structures and (3) existing load supporting members. The computed stresses shall include the effects of erection, movement, and removal of the scaffolding.

If manufactured scaffolding is used, the manufacturer's name, address, and phone number shall be shown on the working drawings.

The working drawings shall be stamped and signed by an engineer who is registered as a Civil Engineer. In addition, prior to submitting the working drawings to the Engineer, the working drawings shall be stamped and signed by an independent reviewer who is registered as a Civil Engineer in the State of California. The independent reviewer shall not be employed by the same entity preparing the working drawings.

The Contractor shall allow 21 days for the review of a complete submittal for scaffolding working drawings. In the event the Engineer fails to complete the review within the time allowed, and if, in the opinion of the Engineer, completion of the work is delayed or interfered with by reason of the Engineer's delay in completing the review, the Contractor will be compensated for any resulting loss, and an extension of time will be granted, in the same manner as provided for in Section 8-1.09, "Right of Way Delays," of the Standard Specifications.

Welding for the manufacturing and erection of scaffolding shall conform to the requirements in AWS D1.1 or D1.2 for steel or aluminum construction respectively.

Full compensation for conforming to the above requirements shall be considered as included in the contract prices paid for the various contract items of work, and no additional compensation will be allowed therefor.

#### 10-1.29 COOPERATION

It is anticipated that work by another contractor may be in progress adjacent to or within the limits of this project during progress of the work on this contract. The following table lists contracts anticipated to be in progress during this contract.

Contract No.	Co-Rte-KP	Location	Type of Work
04-0120M4	04-Ala-80- KP 1.6/ KP 2.7	San Francisco-Oakland Bay Bridge Toll Plaza, in Oakland,	Construct Oakland Touchdown westbound roadway and eastbound structures and roadway
04-012094	04-SF-80-KP 12.5/Ala-80-KP-3.2	SFOBB (East Span)	Remove SFOBB (East Span) and Foundations
04-0120F4	04-SF-80-KP 13.2/KP 13.9	Yerba Buena Island	Construct Self-Anchored Suspension Bridge Superstructure
04-0120N4	04-SF-80-SF/Ala-KP 12.6/ KP 2.7	Yerba Buena Island	Install electrical systems
04-0120S4	04-SF-80-KP 12.7/KP 13.2	Yerba Buena Island	Constructing Yerba Buena Island Transition Structures
04-3A6404	04-SF-80-KP 12.3/13.2	Yerba Buena Island	Constructing westbound ramps
City/County San Francisco	04-SF-80-KP 11.8/KP 12.4	Yerba Buena Island	Replace Treasure Island Road Viaduct
City/County San Francisco	04-SF-80-KP 12.3/13.2	Yerba Buena Island	Install 300 mm Water Pipe on Yerba Buena Island
Treasure Island Development Authority	04-SF-80-KP 12.0/KP 13.1	Yerba Buena Island	Reconstruct Macalla Rd and Develop Yerba Buena Island

Comply with Section 7-1.14, "Cooperation," of the Standard Specifications.

#### 10-1.30 PHOTO SURVEY/PUBLIC RELATIONS

The Contractor shall provide time-lapse video and still photography to document pre-construction conditions, and progress and completion of the work, and facilitate public relation activities as directed by the Engineer. Photography will be paid for as extra work as provided in Section 4-1.03D of the Standard Specifications, and will not be considered a special service as specified in Section 9-1.03B of the Standard Specifications.

#### 10-1.31 TRANSPORTATION FOR THE ENGINEER

The Contractor shall provide transportation for the Engineer in accordance with Section 5-1.08, "Inspection," of the Standard Specifications and these special provisions.

The Contractor shall provide, operate, berth and maintain, beginning with the first mobilization of marine equipment until contract completion, one crew boat for the sole use of the Engineer and the Engineer's staff in

performance of their work. In addition, the Engineer and all authorized representatives of the State, acting within the scope of their duties in connection with the work under this contract, shall be permitted to ride as passengers, without charge, on any boat operated by, or for, the Contractor for the transportation of personnel, equipment or materials. It is agreed that such transportation will be only on the boats that are making trips in connection with the Contractor's operation.

The crew boat shall be 12.2 meters, adequate for open water operations, or equal, with protected seating and meeting or exceeding the following minimum requirements:

1. Drive Power:
  - 1.1. Engines – Diesel engines, 600 HP total, twin screw, capable of at least 25 knots.
  - 1.2. Fuel Tank – 173 gal. tank
2. Equipment:
  - 2.1. Aluminum or steel hull construction
  - 2.2. Tires or rubber fenders for fendering around the boat
  - 2.3. Mooring bits located forward and aft on boat
  - 2.4. 22.8 kg anchor with chain and line (adequate for specific site condition)
3. Electronics:
  - 3.1. VHF/FM Radio System
  - 3.2. One (1) Com 58 or equal
  - 3.3. Radar system Furuno 1731, or equal
  - 3.4. Depth finder digital
  - 3.5. Compass Richie navigator 2 each, or equal

United States Coast Guard-approved life jackets for the Contractor's personnel shall be provided and maintained on the boats at all times, as required by the United States Coast Guard. Life jackets for the Department's visitors and representatives will be provided by the Department at no cost to the Contractor.

The contractor shall provide for the Department's visitors and representatives safe and protected permanent vertical access, as approved by the Engineer, to all marine construction equipment being utilized for construction of the project.

The Contractor shall provide safety training relative to marine transportation to the State's and the Contractor's personnel, prior to the commencement of work. Training shall include a review of the approved U.S. Coast Guard Safety Manual by all personnel prior to using the Contractor's provided marine transportation. The Contractor shall also conduct a quarterly Marine Safety Workshop for the Department's representatives.

The Contractor shall furnish a licensed boat operator and crew members, as required for the boat's operation and in accordance with all Maritime Agreements and Laws, including, but not limited to, the regulations contained in Title 46 Code of Federal Regulation Section 16 and Sections 24 through 26. The boat must have a valid U.S. Coast Guard Certificate of Inspection (COI), and must be manned and operated in accordance with the COI. The boat, boat operator and crew shall be furnished beginning with the first mobilization of marine equipment until contract completion for the duration of the contract. The boat, boat operator and crew shall be furnished for the complete duration of the work on the days when the Contractor's work is in progress and for 8 hours each day excluding Sundays and legal holidays on the days when the Contractor's work is not in progress.

The Contractor shall provide berthing facilities at the same location the Contractor utilizes for the departure of its construction crew, or at an alternate location approved by the Engineer.

The Contractor shall maintain the boat provided to the Engineer, including daily fueling, routine maintenance, equipment compliance, systems operations and the immediate repair of damage to the boat or its elements.

The boat shall remain the property of the Contractor. The boat shall not be removed from the site of the work until after acceptance of the contract.

## **MEASUREMENT AND PAYMENT**

The contract lump sum price paid for transportation for the Engineer shall include full compensation for furnishing all labor, materials, tools, equipment and incidentals, and for doing all the work involved in providing transportation for the engineer as specified herein.

Payment for furnishing a boat, boat operator and crew prior to the times specified and in excess of the complete duration of the work on the days when the Contractor's work is in progress, in excess of 8 hours per day and on Sundays and legal holidays when the Contractor's work is not in progress will be paid for as extra work as provided in Section 4-1.03D of the Standard Specifications. No additional payment will be made for furnishing the boat, boat operator and the crew in excess of the time specified herein.

#### **10-1.32 ENGINEER'S INSPECTION FACILITY**

The Contractor shall provide, and maintain an Engineer's inspection facility, beginning with the first mobilization of marine equipment until contract completion, for the sole use of the Engineer and his representative. The inspection facility shall have at least 18.5 square meters of floor space and shall be located on a barge within the State's right of way, as directed by the Engineer.

The inspection facility shall have windows, doors with locks, heating, air-conditioning, electric lighting, communication hookups, and sanitary facilities. If the Engineer's inspection facility is to be located in the same vessel as the Contractor's Superintendent's office, it shall be partitioned off and provided with a separate entrance.

Equipment to be furnished shall be of standard quality and new, or like new in appearance and function.

The Engineer's inspection facility, equipped as specified, shall be available at the site for the Engineer's use prior to the start of any field work under this contract.

The Contractor shall maintain Engineer's inspection facility, including routine maintenance, and the immediate repair of damage to the said facility or its elements.

The Engineer's inspection facility shall remain the property of the Contractor, and shall not be removed from the site of the work until after acceptance of the contract.

The Contractor shall furnish a licensed boat operator and crew members, as required for the boat's operation and in accordance with all Maritime Agreements and Laws, including, but not limited to, the regulations contained in Title 46 Code of Federal Regulation Section 16 and Sections 24 through 26. The boat must have a valid U.S. Coast Guard Certificate of Inspection (COI), and must be manned and operated in accordance with the COI. The boat, boat operator and crew shall be furnished beginning with the first mobilization of marine equipment until contract completion for the duration of the contract. The boat, boat operator and crew shall be furnished for the complete duration of the work on the days when the Contractor's work is in progress and for 8 hours each day excluding Sundays and legal holidays on the days when the Contractor's work is not in progress.

#### **MEASUREMENT AND PAYMENT**

The contract lump sum price paid for Engineer's inspection facility shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals for doing all work involved in providing the Engineer inspection facility, complete and in place, including maintaining and removing the Engineer's inspection facility, and supplying and paying for electricity, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

#### **10-1.33 BIDDERS COMPENSATION**

The Department recognizes that significant costs are incurred in preparing a bid and performing the advance engineering for a project of this magnitude. To encourage responsible bidders to submit responsive bids, the second lowest, third lowest and fourth lowest bidders shall each receive \$300,000 as compensation for a portion of the costs of preparing a responsive bid. Other unsuccessful bidders will not be compensated for their bids.

Bidders whose bids are determined by the Department to be non-responsive, or who fail to submit a reasonable bid, or who fail to execute the contract will not be eligible for bidder compensation.

Payment of the compensation will be made within 90 days after award of the contract. Within 30 days after award of the contract, the Department will notify the Contractor of the identity of the second low and third low bidders for payment of the bidder compensation. The Contractor shall make the necessary arrangements with the recipients and administer the payments. The Contractor shall provide the Department proof of payment by invoices in accordance with the provisions of Section 9-1.03B, "Work Performed by Special Forces or Other Special Services," of the Standard Specifications within 5 days of the payments. The Contractor shall make payment to the designated recipients and provide proof of receipt to the Department within 5 days of receipt of the pass through payment. The Department will compensate the Contractor for payment of bidders compensation to the second, third and fourth low bidders, in the next monthly progress payment, in conformance with the provisions of Section 9-1.03B, except that no mark up will be added.

Full compensation for the costs of preparing a responsive bid and performing the advance engineering shall be considered as included in the contract prices paid for the various contract items of work and no additional compensation will be allowed therefor.

If the Department rejects all bids and cancels the solicitation the Department will provide bidders compensation to the lowest, second lowest, and third lowest responsible bidders who have submitted responsive bids.

#### **10-1.34 DOCUMENT MANAGEMENT SYSTEM ELECTRONIC DATA DELIVERY**

All documents to be furnished to the Engineer shall be delivered electronically in Portable Document Format (PDF) on flash drives in conformance with the requirements of these special provisions.

Electronic copies of the document shall be compatible with the latest Microsoft Windows operating system utilized by the Department. The electronic files shall conform to the following requirements:

1. The flash drive shall contain electronic copies of the documents in searchable Adobe Portable Document Format (PDF). All documents transmitted by flash drive shall be created by one of the two methods:
  - 1.1. Searchable PDF documents shall be created from the original format of the document.
  - 1.2. Any non-electronic document shall be scanned to the original size in a PDF format and shall be made searchable using Optical Character Recognition (OCR) software.
2. The minimum resolution for a scanned electronic PDF shall be 300 dots per inch and the minimum color depth shall be 256 colors.
3. Each plan sheet or shop drawing shall consist of one electronic PDF file. The original format of the drawing shall be converted to a searchable PDF format.

#### **MEASUREMENT AND PAYMENT**

The contract lump sum price paid for document management system electronic data delivery shall include full compensation for furnishing all labor, material, tools, equipments, and incidents, and for doing all the work involved in providing document management system electronic data delivery, as specified in the Standard Specifications and these special provisions, as directed by the Engineer.

The Department will withhold an amount equal to 25 percent of the bid item price for each estimate period, if the Contractor fails to deliver documents to the Engineer in conformance with document management system electronic data delivery. This withhold will be in addition to all other withholds under Section 9-1.053 "Performance Failure Withholds," of the Standard Specifications. This withhold for failure to deliver an acceptable document management system electronic data delivery will be released for payment on the next monthly estimate following the date that an acceptable document management system electronic data delivery has been made. Upon completion of all contract work, any remaining withheld amounts associated with document management system electronic data delivery will be released for payment. No interest will be due the Contractor on withheld amounts.

#### **10-1.35 PROGRESS SCHEDULE (CRITICAL PATH METHOD)**

##### **GENERAL**

##### **Summary**

Comply with Section 8-1.04, "Progress Schedule," of the Standard Specifications, except you must:

1. Use a computer software to prepare the schedule
2. Furnish compatible software for the Engineer's exclusive possession and use

You are responsible for assuring that all activity sequences are logical and that each schedule shows a coordinated plan for complete performance of the work.

##### **Definitions**

**concurrent delay:** Two or more delays occurring simultaneously or overlapping. Each delay when analyzed separately impacts the contract completion date.

**contract completion date:** The current extended date for completion of the contract shown on the weekly statement of working days furnished by the Engineer as specified in Section 8-1.06, "Time of Completion," of the Standard Specifications.

**controlling operation:** The activity considered at the time by the Engineer, within that series of activities defined as the critical path, which if delayed or prolonged, will delay the time of completion of the contract.

**data date:** The day after the date through which a schedule is current. Everything occurring earlier than the data date is "as-built" and everything on or after the data date is "planned."

**delay:** The time period during which some part of the construction project has been extended beyond what was originally planned due to unanticipated circumstances. A delay occurs when the respective activity or activities, requiring additional time, impacts the completion of the successor construction activity and also extends the scheduled contract completion date.

**early completion time:** The difference in time between an early scheduled completion date and the contract completion date.

**float:** The difference between the earliest and latest allowable start or finish times for an activity.

**milestone:** An event activity that has zero duration and is typically used to represent the beginning or end of a certain stage of the project.

**narrative report:** A document submitted with each schedule that discusses topics related to project progress and scheduling.

**near critical path:** A chain of activities with total float exceeding that of the critical path but having no more than 30 working days of total float.

**State owned float activity:** The activity documenting time saved on the critical path by actions of the State. It is the last activity prior to the scheduled completion date.

**time impact analysis:** A schedule and narrative report developed specifically to demonstrate what effect a proposed change or delay has on the current scheduled completion date.

**time-scaled network diagram:** A graphic depiction of a CPM schedule comprised of activity bars with relationships for each activity represented by arrows. The tail of each arrow connects to the activity bar for the predecessor and points to the successor.

**total float:** The amount of time that an activity or chain of activities can be delayed before extending the scheduled completion date.

## **Submittals**

### **General Requirements**

Submit to the Engineer baseline, monthly updated, and final updated schedules, each consistent in all respects with the time and order of work requirements of the contract. Perform work in the sequence indicated on the current accepted schedule.

Each schedule must show:

1. All project characteristics, salient features and interfaces, including those with outside entities that could affect time of completion.
2. Calculations using the critical path method to determine controlling activities.
3. Duration activities less than 20 working days, unless otherwise approved by the Engineer.
4. At least 50 but not more than 1000 activities, unless authorized. The number of activities must be sufficient to assure adequate planning of the project, to permit monitoring and evaluation of progress, and to do an analysis of time impacts.
5. Each required constraint. Constraints other than those required by the special provisions may be included only if authorized.
6. State-owned float as the predecessor activity to the scheduled completion date.
7. Activities with identification codes for responsibility, stage, work shifts, location, and contract pay item numbers.
8. All task activities must be assigned to a project calendar. Each calendar must identify a workweek and holidays. Different calendars must be used for work activities that occur on different work schedules. All non-activity periods for environmental work restrictions must be identified with the appropriate calendar.
9. Retained logic must be used when calculating the schedule.

You may show early completion time on any schedule provided that the requirements of the contract are met. Early completion time is considered a resource for your exclusive use. You may increase early completion time by improving production, reallocating resources to be more efficient, performing sequential activities concurrently, or by completing activities earlier than planned. You may also submit for approval a VECP as specified in Section 4-1.035B, "Value Engineering Change Proposal." of the Standard Specifications that will reduce time of construction.

You may show a scheduled completion date that is later than the contract completion date on an update schedule, after the baseline schedule is accepted. Provide an explanation for a late scheduled completion date in the narrative report that is included with the schedule. During any period showing a late scheduled completion, the Engineer may require a recovery schedule depicting how you intend to bring the project back to the approved project completion date. This recovery schedule is in addition to the update schedule.

State-owned float is considered a resource for the exclusive use of the State. The Engineer may accrue State-owned float by the early completion of review of any type of required submittal when it saves time on the critical path. Prepare a time impact analysis, when requested by the Engineer, to determine the effect of the action as specified in "Time Impact Analysis." The Engineer documents State-owned float by directing you to update the State-owned float activity on the next updated schedule. Include a log of the action on the State-owned float activity and include a discussion of the action in the narrative report. The Engineer may use State-owned float to mitigate past, present, or future State delays by offsetting potential time extensions for contract change orders.

The Engineer may adjust contract working days for ordered changes that affect the scheduled completion date as specified in Section 4-1.03, "Changes," of the Standard Specifications. Prepare a time impact analysis to determine the effect of the change as specified in "Time Impact Analysis" and include the impacts acceptable to the Engineer in the next updated schedule. Changes that do not affect the controlling operation on the critical path will not be considered as the basis for a time adjustment. Changes that do affect the controlling operation on the critical path will be considered by the Engineer in decreasing time or granting an extension of time for completion of the contract. Time extensions will only be granted if the total float is absorbed and the scheduled completion date is delayed one or more working days because of the ordered change.

The Engineer's review and acceptance of schedules does not waive any contract requirements and does not relieve you of any obligation or responsibility for submitting complete and accurate information. Correct rejected schedules and resubmit them within 7 days of notification by the Engineer, at which time a new review period of 7 days will begin.

Errors or omissions on schedules do not relieve you from finishing all work within the time limit specified for completion of the contract. If, after a schedule has been accepted by the Engineer, either you or the Engineer discover that any aspect of the schedule has an error or omission, you must correct it on the next updated schedule.

### **Computer Equipment and Software**

Submit to the Engineer for review a description of proposed schedule software and plotter to be used. After the Engineer accepts the proposed software, furnish schedule software and all original software instruction manuals. All software must be compatible with the current version of the Windows operating system in use by the Engineer. The schedule software must include the latest version of Oracle Primavera P6 Professional Project Management for Windows, or equivalent.

If a schedule software equivalent to P6 is proposed, it must be capable of:

1. Generating files that can be imported into P6
2. Comparing 2 schedules and providing reports of changes in activity ID, activity description, constraints, calendar assignments, durations, and logic ties

Provide a color-ink-jet plotter with a minimum 36 Megabytes RAM, capable of 300 dots per inch color, 600 dots per inch monochrome, or equivalent. Capable of printing fully legible, time scaled charts, and network diagrams, in four colors, with a minimum size of 914mm x 1219mm (E size) and is compatible with the selected system. HP Designjet T2300, equivalent or later. Contractor must provide all necessary maintenance, ink and supplies, and plotter paper for the printer throughout the duration of the project

The schedule software, schedule-comparing software and plotter will be returned to you before the final estimate. The Department will compensate you as specified in Section 4-1.03D, "Extra Work," of the Standard Specifications for replacement of software or manuals damaged, lost, or stolen after delivery to the Engineer.

Instruct the Engineer in the use of the software and provide software support until the contract is accepted. Within 15 days of contract approval, provide a commercial 8-hour training session for 2 Department employees in the use of the software at a location acceptable to the Engineer. It is recommended that you also send at least 2 employees to the same training session to facilitate development of similar knowledge and skills in the use of the software. If schedule software other than P6 is submitted, then the training session must be a total of 16-hours for each Department employee.

### **Network Diagrams, Reports, and Data**

Include the following with each schedule submittal:

1. One set of originally plotted, time-scaled network diagrams
2. Two copies of a narrative report
3. Two read-only compact disks or floppy diskettes containing the schedule data

The time-scaled network diagrams must conform to the following:

1. Show a continuous flow of information from left to right
2. Be based on early start and early finish dates of activities
3. Clearly show the primary paths of criticality using graphical presentation
4. Be prepared on 914mm x 1219mm
5. Include a title block and a timeline on each page

The narrative report must be organized in the following sequence with all applicable documents included:

1. Transmittal letter
2. Work completed during the period
3. Identification of unusual conditions or restrictions regarding labor, equipment or material; including multiple shifts, 6-day work weeks, specified overtime or work at times other than regular days or hours
4. Description of the current critical path
5. Changes to the critical path and scheduled completion date since the last schedule submittal
6. Description of problem areas
7. Current and anticipated delays:
  - 7.1. Cause of delay
  - 7.2. Impact of delay on other activities, milestones, and completion dates
  - 7.3. Corrective action and schedule adjustments to correct the delay
8. Pending items and status thereof:
  - 8.1. Permits
  - 8.2. Change orders
  - 8.3. Time adjustments
  - 8.4. Noncompliance notices
  - 8.5. Notice of Potential Claims
9. Reasons for an early or late scheduled completion date in comparison to the contract completion date
10. Responses to previous schedule comments

Schedule submittals will only be considered complete when all documents and data have been submitted as described above.

### **Preconstruction Scheduling Conference**

Schedule a preconstruction scheduling conference with your project manager and the Engineer within 15 days after contract approval. The Engineer will conduct the meeting and review the requirements of this section with you.

Submit a general time-scaled logic diagram displaying the major activities and sequence of planned operations and be prepared to discuss the proposed work plan and schedule methodology, all software scheduling variables and options that comply with the requirements of this section. If you propose deviations to the construction staging, then the general time-scaled logic diagram must also display the deviations and resulting time impacts. Be prepared to discuss the proposal.

At this meeting, also submit the alphanumeric coding structure and activity identification system for labeling work activities. The Engineer may submit a scheduling shell project displaying an activity code dictionary consisting of fields populated with the Department scheduling codes, filters, layouts, report formats and a resource dictionary to be incorporated into the schedule. To easily identify relationships, each activity description must indicate its associated scope or location of work by including such terms as quantity of material, type of work, bridge number, station to station location, side of highway (such as left, right, northbound, southbound), lane number, shoulder, ramp name, ramp line descriptor, or mainline.

The Engineer reviews the logic diagram, coding structure, and activity identification system, and provide any required baseline schedule changes to you for implementation.



### **Baseline Schedule**

Beginning the week following the preconstruction scheduling conference, meet with the Engineer weekly to discuss schedule development and resolve schedule issues until the baseline schedule is accepted.

Submit a baseline schedule within 6 weeks of contract approval. Allow 3 weeks for the Engineer's review after the baseline schedule and all support data are submitted. In addition, the baseline schedule submittal is not considered complete until the computer software is delivered and installed for use in review of the schedule.

The baseline schedule must include the entire scope of work and how you plan to complete all work contemplated. The baseline schedule must meet interim milestone dates, contract milestones dates, stage construction requirements, internal time constraints, and show logical sequence of activities. The baseline schedule must show the activities that define the critical path. Multiple critical paths and near-critical paths must be kept to a minimum. A total of not more than 50 percent of the baseline schedule activities must be critical or near critical, unless otherwise authorized.

The baseline schedule must not extend beyond the number of contract working days. The baseline schedule must have a data date of contract approval. If you start work before contract approval, the baseline schedule must have a data date of the 1st day you performed work at the job site.

The baseline schedule must be supplemented with resource allocations for every task activity and include time-scaled resource histograms. The resource allocations must be shown to a level of detail that facilitates report generation based on labor crafts and equipment classes for you and your subcontractors. Use average composite crews to display the labor loading of on-site construction activities. Optimize and level labor to reflect a reasonable plan for accomplishing the work of the contract and to assure that resources are not duplicated in concurrent activities. The time-scaled resource histograms must show labor crafts and equipment classes to be used. The Engineer may review the baseline schedule activity resource allocations using Means Productivity Standards or equivalent to determine if the schedule is practicable.

### **Updated Schedule**

Submit an updated schedule and meet with the Engineer to review contract progress, on or before the 1st day of each month, beginning one month after the baseline schedule is accepted. Allow 15 days for the Engineer's review after the updated schedule and all support data are submitted and the review meeting is held, except that the review period will not start until the previous month's required schedule is accepted. Updated schedules that are not accepted or rejected within the review period are considered accepted by the Engineer. Rejected schedules must be re-submitted within one week, at which time a new one week review time will begin.

The updated schedule must have a data date of the 21st day of the month or other date established by the Engineer. The updated schedule must show the status of work actually completed to date and the work yet to be performed as planned. Actual activity start dates, percent complete, and finish dates must be shown as applicable. Durations for work that has been completed must be shown on the updated schedule as the work actually occurred, including Engineer submittal review and your resubmittal times.

You may include modifications such as adding or deleting activities or changing activity constraints, durations, or logic that do not (1) alter the critical path(s) or near critical path(s) or (2) extend the scheduled completion date compared to that shown on the current accepted schedule. Justify in writing the reasons for any changes to planned work. If any proposed changes in planned work will result in (1) or (2) above, then submit a time impact analysis as specified in this section.

### **Weekly Schedule Progress Meetings**

Beginning the week following the preconstruction scheduling conference, meet with the Engineer weekly to discuss the near term scheduled activities, address any long term schedule issues, address the weekly controlling operation and to discuss any relevant technical issues.

Submit a rolling 4-week schedule identifying the previous week worked and a 3-week look ahead one day before the meeting. The Engineer will approve the 4-week schedule form and software. The 4-week rolling schedule must be at least as detailed as the latest accepted schedule and provide sufficient detail to include your actual and planned activities and those of your subcontractors for offsite and construction activities. Address all activities to be performed and identify issues requiring engineering input or action.

Each activity in the 4-week rolling schedule must be identified by an associated CPM schedule activity ID numbering system.

### **Time Impact Analysis**

Submit a written time impact analysis (TIA) with each request for adjustment of contract time, or when you or the Engineer consider that an approved or anticipated change may impact the critical path or contract progress.

The TIA must illustrate the impacts of each change or delay on the current scheduled completion date or internal milestone, as appropriate. The analysis must use the accepted schedule that has a data date closest to and before the event. If the Engineer determines that the accepted schedule used does not appropriately represent the conditions before the event, the accepted schedule must be updated to the day before the event being analyzed. The TIA must include an impact schedule developed from incorporating the event into the accepted schedule by adding or deleting activities, or by changing durations or logic of existing activities. If the impact schedule shows that incorporating the event modifies the critical path and scheduled completion date of the accepted schedule, the difference between scheduled completion dates of the two schedules must be equal to the adjustment of contract time. The Engineer may construct and use an appropriate project schedule or other recognized method to determine adjustments in contract time until you provide the TIA.

Time extensions will be granted only to the extent that equitable time adjustments for the activity or activities affected exceed the total or remaining float along the critical path from the time of actual delay or from the time the contract change order work is performed. Mitigation measures must be included in the schedule analysis. The TIA must also consider the use of State Owned Float as a mitigation measure. Time extensions will not be granted nor will delay damages be paid unless:

1. The delay is beyond the control and without fault or negligence of the contractor and its subcontractors or suppliers of any tier; and
2. The delay extends the actual performance of the work beyond the current contract completion date.
3. The delay impacts a fabrication or construction activity – delays to the Contractors submittal or shop drawing process must impact a successor fabrication or construction activity.

Submit 2 copies of your TIA within 20 days of receiving a written request for a TIA from the Engineer. Allow the Engineer 15 days after receipt to review the submitted TIA. All approved TIA schedule changes must be shown on the next updated schedule.

If a TIA you submit is rejected, meet with the Engineer to discuss and resolve issues related to the TIA. If agreement is not reached, you are allowed 5 days from the date you receive the Engineer's response to your protest to submit an Initial Potential Claim Record as specified in Section 9-1.04, "Notice of Potential Claim," of the Standard Specifications. Only show actual as-built work, not unapproved changes related to the TIA, in subsequent updated schedules. If agreement is reached at a later date, approved TIA schedule changes must be shown on the next updated schedule. The Engineer withholds remaining payment on the schedule contract item if a TIA is requested and not submitted within 20 days. The schedule item payment resumes on the next estimate after the requested TIA is submitted. No other contract payment is withheld regarding TIA submittals.

### **Final Updated Schedule**

Submit a final update, as-built schedule with actual start and finish dates for the activities, within 30 days after completion of contract work. Provide a written certificate with this submittal signed by your project manager or an officer of the company stating, "To my knowledge and belief, the enclosed final update schedule reflects the actual start and finish dates of the actual activities for the project contained herein." An officer of the company may delegate in writing the authority to sign the certificate to a responsible manager.

### **PAYMENT**

Progress schedule (critical path method) will be paid for at a lump sum price. The contract lump sum price paid for progress schedule (critical path method) includes full compensation for furnishing all labor, material, tools, equipment, and incidentals, including computer software, plotter, paper and plotter ink and for doing all the work involved in preparing, furnishing, and updating schedules, and instructing and assisting the Engineer in the use of computer software, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

Payments for the progress schedule (critical path method) contract item will be made progressively as follows:

1. A total of 25 percent of the item amount will be paid upon achieving all of the following:
  - 1.1. Completion of 5 percent of all contract item work.
  - 1.2. Acceptance of all schedules and approval of all TIAs required to the time when 5 percent of all contract item work is complete.
  - 1.3. Delivery of schedule software to the Engineer.
  - 1.4. Completion of required schedule software training.

2. A total of 50 percent of the item amount will be paid upon completion of 25 percent of all contract item work and acceptance of all schedules and approval of all TIAs required to the time when 25 percent of all contract item work is complete.
3. A total of 75 percent of the item amount will be paid upon completion of 50 percent of all contract item work and acceptance of all schedules and approval of all TIAs required to the time when 50 percent of all contract item work is complete.
4. A total of 100 percent of the item amount will be paid upon completion of all contract item work, acceptance of all schedules and approval of all TIAs required to the time when all contract item work is complete, and submittal of the certified final update schedule.

If you fail to complete any of the work or provide any of the schedules required by this section, the Engineer makes an adjustment in compensation as specified in Section 4-1.03C, "Changes in Character of Work," of the Standard Specifications for the work not performed. Adjustments in compensation for schedules will not be made for any increased or decreased work ordered by the Engineer in submitting schedules.

#### **10-1.36 TIME-RELATED OVERHEAD**

The Contractor will be compensated for time-related overhead as described below and in conformance with "Force Account Payment" of these special provisions. The Contractor will not be compensated for time-related overhead for delays to the controlling operations caused by the Engineer that occur prior to the first working day, but will be compensated for actual overhead costs incurred, as determined by an independent Certified Public Accountant audit examination and report.

Attention is directed to "Beginning of Work, Time of Completion and Liquidated Damages," "Force Account Payment," and "Progress Schedule (Critical Path Method)" of these special provisions.

The provisions in Section 9-1.08, "Adjustment of Overhead Costs," of the Standard Specifications shall not apply.

Time-related overhead shall consist of those overhead costs, including field and home office overhead, that are in proportion to the time required to complete the work. Time-related overhead shall not include costs that are not related to time, including but not limited to, mobilization, licenses, permits, and other charges incurred only once during the contract. Time-related overhead shall not apply to subcontractors of any tier, suppliers, fabricators, manufacturers, or other parties associated with the Contractor.

Field office overhead expenses include time-related costs associated with the normal and recurring operations of the construction project, and shall not include costs directly attributable to the work of the contract. Time-related costs of field office overhead include, but are not limited to, salaries, benefits, and equipment costs of project managers, general superintendents, field office managers and other field office staff assigned to the project, and rent, utilities, maintenance, security, supplies, and equipment costs of the project field office.

Home office overhead or general and administrative expenses refer to the fixed costs of operating the Contractor's business. These costs include, but are not limited to, general administration, insurance, personnel and subcontract administration, purchasing, accounting, and project engineering and estimating. Home office overhead costs shall exclude expenses specifically related to other contracts or other businesses of the Contractor, equipment coordination, material deliveries, and consultant and legal fees.

The amount of time-related overhead associated with a reduction in contract time for cost reduction incentive proposals accepted and executed in conformance with the provisions in Section 5-1.14, "Cost Reduction Incentive," of the Standard Specifications shall be considered a construction cost attributable to the resultant estimated net savings due to the cost reduction incentive.

If the final increased amount of time-related overhead exceeds 149 percent of the contract lump sum price bid, the Contractor shall, within 60 days of the Engineer's written request, submit to the Engineer an audit examination and report performed by an independent Certified Public Accountant of the Contractor's actual overhead costs. The audit examination and report shall depict the Contractor's project and company-wide financial records and shall specify the actual overall average daily rates for both field and home office overhead for the entire duration of the project, and whether the costs have been properly allocated. The rates of field and home office overhead shall exclude unallowable costs as determined in the Federal Acquisition Regulations, 48 CFR, Chapter 1, Part 31.

Independent Certified Public Accountant's audit examinations shall be performed in conformance with the requirements of the American Institute of Certified Public Accountants Attestation Standards. Audit examinations and reports shall determine if the rates of field office overhead and home office overhead are:

- A. Allowable in conformance with the requirements of the Federal Acquisition Regulations, 48 CFR, Chapter 1, Part 31.
- B. Adequately supported by reliable documentation.

C. Related solely to the project under examination.

Within 20 days of receipt of the Engineer's written request, the Contractor shall make its financial records available for audit by the State for the purpose of verifying the actual rate of time-related overhead specified in the audit submitted by the Contractor. The actual rate of time-related overhead specified in the audit, submitted by the Contractor, will be subject to approval by the Engineer.

If the Engineer requests the independent Certified Public Accountant audit, or if it is requested in writing by the Contractor, the contract lump sum payment for time-related overhead, in excess of 149 percent of the lump sum price bid, will be adjusted to reflect the actual rate.

The cost of performing an independent Certified Public Accountant audit examination and submitting the report, requested by the Engineer, will be borne equally by the State and the Contractor. The division of the cost will be made by determining the cost of providing an audit examination and report in conformance with the provisions of Section 9-1.03B, "Work Performed by Special Forces or Other Special Services" of the Standard Specifications, and paying to the Contractor one-half of that cost. The cost of performing an audit examination and submitting the independent Certified Public Accountant audit report for overhead claims other than for the purpose of verifying the actual rate of time-related overhead shall be entirely borne by the Contractor. The cost of performing an audit examination and submitting the independent Certified Public Accountant audit report to verify actual overhead costs incurred prior to the first working day shall be entirely borne by the Contractor.

Time-related overhead will be paid for at a lump sum price. The contract lump sum price bid for time-related overhead will be increased or decreased only as a result of suspensions or adjustments of contract time which revise the current contract completion date and which satisfy any of the following criteria:

- A. Suspensions of work ordered in conformance with the provisions in Section 8-1.05, "Temporary Suspension of Work," of the Standard Specifications, except:
  - 1. Suspensions ordered due to weather conditions being unfavorable for the suitable prosecution of the controlling operation or operations.
  - 2. Suspensions ordered due to the failure on the part of the Contractor to carry out orders given, or to perform the provisions of the contract.
  - 3. Suspensions ordered due to factors beyond the control of and not caused by the State or the Contractor, for which the Contractor is granted extensions of time in conformance with the provisions of the third paragraph of Section 8-1.07, "Liquidated Damages," of the Standard Specifications.
  - 4. Other suspensions that mutually benefit the State and the Contractor.
- B. Extensions of contract time granted by the State in conformance with the provisions in the fifth paragraph in Section 8-1.07, "Liquidated Damages," of the Standard Specifications and set forth in approved contract change orders, in conformance with the provisions in Section 4-1.03, "Changes," of the Standard Specifications.
- C. Reductions in contract time set forth in approved contract change orders, in conformance with the provisions in Section 4-1.03, "Changes," of the Standard Specifications.

For each day the number of working days to complete the contract, in conformance with the provisions in "Beginning Of Work, Time Of Completion And Liquidated Damages," of these special provisions, is increased or decreased due to suspensions or adjustments of contract time as specified above, the lump sum price for time-related overhead will be increased or decreased by an amount equal to the contract lump sum price bid for time-related overhead divided by the number of working days to complete the contract.

In the event an early completion progress schedule, as defined in "Progress Schedule (Critical Path Method)" of these special provisions, is submitted by the Contractor and approved by the Engineer, the amount of time-related overhead eligible for payment will be based on the total number of working days for the project, in conformance with the provisions in "Beginning of Work, Time of Completion and Liquidated Damages" of these special provisions, rather than the Contractor's early completion progress schedule.

The contract lump sum price paid for time-related overhead shall include full compensation for time-related overhead, including the Contractor's share of costs of an independent Certified Public Accountant audit of overhead costs requested by the Engineer, as specified in these special provisions, and as directed by the Engineer.

The provisions in Sections 4-1.03B, "Increased or Decreased Quantities," and 4-1.03C, "Changes in Character of the Work," of the Standard Specifications shall not apply to the contract item of time-related overhead.

Full compensation for additional overhead costs involved in incentive and disincentive provisions to satisfy internal milestone or multiple calendar requirements shall be considered as included in the contract items of work involved and no additional compensation will be allowed therefor.

Full compensation for additional overhead costs incurred during days of inclement weather when the contract work is extended into additional construction seasons due to delays caused by the State shall be considered as included in the time-related overhead paid during the contract working days, and no additional compensation will be allowed therefor.

Full compensation for additional overhead costs involved in performing additional contract item work that is not a controlling operation shall be considered as included in the contract items of work involved, and no additional compensation will be allowed therefor.

Full compensation for overhead, other than time-related overhead measured and paid for as specified above, and other than overhead costs included in the markups specified in "Force Account Payment" of these special provisions, shall be considered as included in the various items of work and no additional compensation will be allowed therefor.

Overhead costs incurred by subcontractors of any tier, suppliers, fabricators, manufacturers, and other parties associated with the Contractor shall be considered as included in the various items of work and as specified in Section 9-1.03, "Force Account Payment," of the Standard Specifications.

For the purpose of making partial payments pursuant to the provisions in Section 9-1.06, "Partial Payments," of the Standard Specifications, the amount of time-related overhead in each monthly partial payment will be based on the number of working days that occurred during that monthly estimate period, including compensable suspensions and right of way delays. Working days granted by contract change order due to extra work or changes in character of work, will be compensated upon completion of the contract. The amount earned per working day for time-related overhead shall be the lesser of the following amounts:

- A. The contract lump sum price for time-related overhead, divided by the number of working days to complete the contract, in conformance with the provisions in "Beginning Of Work, Time Of Completion And Liquidated Damages," of these special provisions.
- B. Twenty percent of the original total contract amount, divided by the number of working days to complete the contract, in conformance with the provisions in "Beginning Of Work, Time Of Completion And Liquidated Damages," of these special provisions.

After acceptance of the contract in conformance with the provisions in Section 7-1.17, "Acceptance of Contract," of the Standard Specifications, the amount of the contract lump sum price for time-related overhead not yet paid, will be included for payment in the first estimate made after acceptance of the contract in conformance with the provisions in Section 9-1.07, "Payment After Acceptance," of the Standard Specifications.

#### **10-1.37 EMERGENCY ACCESS ROAD CONTINGENCY PLAN**

This work shall consist of staging the work and providing contingency plan for an emergency access road with minimal impact to local traffic immediately at any time, in the event the Treasure Island Road Viaduct and Macalla Road become unusable, as directed by the Engineer and as specified in these special provisions.

Attention is directed to the provisions in "Permits, Licenses, Agreements, and Certifications," and "Relation with the United States Coast Guard," of these special provisions regarding the USCG License provisions and the 24 hours per day and 7 days per week (24/7) access and emergency access to its properties on YBI.

Treasure Island Road, Macalla Road, and Southgate Road are the primary arterial local streets to serve all local traffic between the Treasure Island and Yerba Buena Island. Southgate Road is the critical local street facility that links access from USCG facilities to Route 80.

The Contractor shall submit the contingency plan in conformance with "Working Drawings," of these special provisions for the Engineer's approval 30 working days prior to the start of any closure to local street(s) within the contract limits.

Contingency plan shall include:

1. Include the opening of the following facilities available to USCG for its 24/7 operations
2. Provide and maintain Southgate Road (critical link) to allow access Route 80 with the following features:
  - 2.1. A minimum 3.6-meter wide paved traffic lane, along the west side of the Soldier pile wall location
  - 2.2. A minimum vertical clearance of 3.7-meter
  - 2.3. A finished profile grade of not to exceed 10%
  - 2.4. Temporary railing (Type K) along the edge of traveled way to shield fixed objects and drop offs

When the Treasure Island Road Viaduct and Macalla Road become unusable, the Contractor will receive a written notice to implement the contingency plan from the Engineer. Minimal impact to the work as used herein is

defined to mean that major operations such as excavations and concrete pours are not prevented from continuing by local traffic using the emergency access road.

The Contractor will not be required to implement any part of the contingency plan except as directed by the Engineer.

Should any portion of the contingency plan be implemented at the written direction of the Engineer, such work will be paid for as extra work as provided in Section 4-1.03D "Extra Work" of the Standard Specifications.

Full compensation for staging the work and providing a contingency plan for the emergency access road through the work immediately shall be considered as included in the prices paid for the various contract items of work and no separate payment will be made therefor.

If, in the opinion of the Engineer, completion of the work is delayed or interfered with due to the implementation of the emergency access road, an extension of time will be granted, in the same manner as provided for in Section 8-1.09, "Right of Way Delays," of the Standard Specifications. No additional compensation will be provided to the Contractor.

#### **10-1.38 TEMPORARY SHUTTLE VAN SERVICE**

The Contractor shall provide a temporary shuttle van service for transporting general public and passengers on Yerba Buena Island (YBI) to reduce number of personal vehicles and to facilitate the construction of the bridge, as directed by the Engineer. The service will operate as follows:

1. The Contractor shall provide 16-passenger ADA compliant/lift-equipped vans and qualified and experienced operators. The shuttle van service shall maintain the required insurances and a current Charter Party permit or Passenger Stage permit issued by the State of California Public Utilities Commission applicable to operate as required, and provide a copy to the Engineer.
2. The shuttle route and the planned stops shall be along Macalla Road and Treasure Island Road, as shown on the plans and as approved by the Engineer. The shuttle will service passengers on YBI and depart from the Treasure Island (TI) Main Gate, proceeding along Macalla Road, with proposed turnaround point noted as the U.S. Coast Guard Station Gate at the end of Macalla Road. A round trip is approximately 2.3 miles long and takes approximately 16 minutes.
3. The shuttle route and the schedule shall connect and conform to the existing San Francisco Municipal Railway (Muni) Route 108 motor coach service, which operates a bus service on YBI and TI from the Transbay Terminal in downtown San Francisco. Based on the existing Muni Route 108 schedule, it is estimated that two vans will be needed when 15 minute service is provided on Muni Route 108 and one van would be needed at all other times. The Contractor shall coordinate with San Francisco MUNI's Service Planning Department at (415) 934-3999, at 15 working days prior to commencing service.
4. Any schedule changes in the SF Muni Route 108 Motor Coach Service shall be incorporated in the Temporary Shuttle Van Service provided by the Contractor.
5. The shuttle shall provide a timed transfer with Muni Route 108 at the TI Main Gate.
6. The service shall operate 24 hours a day, seven days a week, once Southgate Road is closed to general public traffic simultaneously with the closure of eastbound 80 off-ramp, or at the discretion of the Engineer.
7. The service shall be free to the public/passengers.

The contract lump sum price paid for temporary shuttle van service shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in providing temporary shuttle van service, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

#### **10-1.39 CONSTRUCTION AREA TRAFFIC CONTROL DEVICES**

Flagging, signs, and temporary traffic control devices furnished, installed, maintained, and removed when no longer required shall conform to the provisions in Section 12, "Construction Area Traffic Control Devices," of the Standard Specifications and these special provisions.

Category 1 temporary traffic control devices are defined as small and lightweight (less than 45 kg) devices. These devices shall be certified as crashworthy by crash testing, crash testing of similar devices, or years of demonstrable safe performance. Category 1 temporary traffic control devices include traffic cones, plastic drums, portable delineators, and channelizers.

If requested by the Engineer, the Contractor shall provide written self-certification for crashworthiness of Category 1 temporary traffic control devices at least 5 business days before beginning any work using the devices or

within 2 business days after the request if the devices are already in use. Self-certification shall be provided by the manufacturer or Contractor and shall include the following:

- A. Date,
- B. Federal Aid number (if applicable),
- C. Contract number, district, county, route and kilometer post of project limits,
- D. Company name of certifying vendor, street address, city, state and zip code,
- E. Printed name, signature and title of certifying person; and
- F. Category 1 temporary traffic control devices that will be used on the project.

The Contractor may obtain a standard form for self-certification from the Engineer.

Category 2 temporary traffic control devices are defined as small and lightweight (less than 45 kg) devices that are not expected to produce significant vehicular velocity change, but may cause potential harm to impacting vehicles. Category 2 temporary traffic control devices include barricades and portable sign supports.

Category 2 temporary traffic control devices shall be on the Federal Highway Administration's (FHWA) list of Acceptable Crashworthy Category 2 Hardware for Work Zones. This list is maintained by FHWA and can be located at:

[http://safety.fhwa.dot.gov/roadway\\_dept/policy\\_guide/road\\_hardware/listing.cfm?code=workzone](http://safety.fhwa.dot.gov/roadway_dept/policy_guide/road_hardware/listing.cfm?code=workzone)

The Department also maintains this list at:

<http://www.dot.ca.gov/hq/traffops/signtech/signdel/pdf/Category2.pdf>

Category 2 temporary traffic control devices that have not received FHWA acceptance shall not be used. Category 2 temporary traffic control devices in use that have received FHWA acceptance shall be labeled with the FHWA acceptance letter number and the name of the manufacturer. The label shall be readable and permanently affixed by the manufacturer. Category 2 temporary traffic control devices without a label shall not be used.

If requested by the Engineer, the Contractor shall provide a written list of Category 2 temporary traffic control devices to be used on the project at least 5 business days before beginning any work using the devices or within 2 business days after the request if the devices are already in use.

Category 3 temporary traffic control devices consist of temporary traffic-handling equipment and devices that weigh 45 kg or more and are expected to produce significant vehicular velocity change to impacting vehicles. Temporary traffic-handling equipment and devices include crash cushions, truck-mounted attenuators, temporary railing, temporary barrier, and end treatments for temporary railing and barrier.

Type III barricades may be used as sign supports if the barricades have been successfully crash tested, meeting the NCHRP Report 350 criteria, as one unit with a construction area sign attached.

Category 3 temporary traffic control devices shall be shown on the plans or on the Department's Highway Safety Features list. This list is maintained by the Division of Engineering Services and can be found at:

[http://www.dot.ca.gov/hq/esc/approved\\_products\\_list/](http://www.dot.ca.gov/hq/esc/approved_products_list/)

Category 3 temporary traffic control devices that are not shown on the plans or not listed on the Department's Highway Safety Features list shall not be used.

Full compensation for providing self-certification for crashworthiness of Category 1 temporary traffic control devices and for providing a list of Category 2 temporary traffic control devices used on the project shall be considered as included in the prices paid for the various items of work requiring the use of the Category 1 or Category 2 temporary traffic control devices and no additional compensation will be allowed therefor.

#### **10-1.40 CONSTRUCTION AREA SIGNS**

Construction area signs for temporary traffic control shall be furnished, installed, maintained, and removed when no longer required in conformance with the provisions in Section 12, "Construction Area Traffic Control Devices," of the Standard Specifications and these special provisions.

Attention is directed to "Furnish Sign" of these special provisions.

Attention is directed to the provisions in "Prequalified and Tested Signing and Delineation Materials" of these special provisions. Type II retroreflective sheeting shall not be used on construction area sign panels. Type III, IV, VII, VIII, or IX retroreflective sheeting shall be used for stationary mounted construction area sign panels.

Unless otherwise shown on the plans or specified in these special provisions, the color of construction area warning and guide signs shall have black legend and border on orange background, except W10-1 or W47(CA) (Highway-Rail Grade Crossing Advance Warning) sign shall have black legend and border on yellow background.

Orange background on construction area signs shall be fluorescent orange.

Repair to construction area sign panels will not be allowed, except when approved by the Engineer. At nighttime under vehicular headlight illumination, sign panels that exhibit irregular luminance, shadowing or dark blotches shall be immediately replaced at the Contractor's expense.

The Contractor shall notify the appropriate regional notification center for operators of subsurface installations at least 2 business days, but not more than 14 days, prior to commencing excavation for construction area sign posts. The regional notification centers include, but are not limited to, the following:

Notification Center	Telephone Number
Underground Service Alert	811

Excavations required to install construction area signs shall be performed by hand methods without the use of power equipment, except that power equipment may be used if it is determined there are no utility facilities in the area of the proposed post holes. The post hole diameter, if backfilled with portland cement concrete, shall be at least 100 mm greater than the longer dimension of the post cross-section.

Construction area signs placed within 4.6 m from the edge of the travel way shall be mounted on stationary mounted sign supports as specified in "Construction Area Traffic Control Devices" of these special provisions.

The Contractor shall maintain accurate information on construction area signs. Signs that are no longer required shall be immediately covered or removed. Signs that convey inaccurate information shall be immediately replaced or the information shall be corrected. Covers shall be replaced when they no longer cover the signs properly. The Contractor shall immediately restore to the original position and location any sign that is displaced or overturned, from any cause, during the progress of work.

#### **10-1.41 DUST CONTROL**

Dust control shall conform to the provisions in Section 10, "Dust Control," of the Standard Specifications and these special provisions.

#### **10-1.42 MAINTAINING TRAFFIC**

Maintaining traffic shall conform to the provisions in Sections 7-1.08, "Public Convenience," Section 7-1.09, "Public Safety," and Section 12, "Construction Area Traffic Control Devices," of the Standard Specifications, "Public Safety" of these special provisions and these special provisions.

Closure is defined as the closure of a traffic lane or lanes, including shoulder, ramp or connector lanes, within a single traffic control system.

Closures shall conform to the provisions in "Traffic Control System for Lane Closure" of these special provisions.

In addition to the provisions set forth in "Public Safety" of these special provisions, whenever work, including the work of installing, maintaining, and removing temporary railing (Type K) is to be performed on the freeway within 1.8 m of the adjacent traffic lane, the adjacent traffic lane shall be closed.

Except as listed above, closure of adjacent traffic lane will not be required for grinding and grooving operations, and for installing, maintaining and removing traffic control devices.

At locations where falsework pavement lighting is designated, falsework lighting shall be installed in conformance with the provisions in Section 86-6.11, "Falsework Lighting," of the Standard Specifications.

Openings shall be provided through bridge falsework for the use of public traffic at each location where falsework is constructed over the streets or routes listed in the following table. The type, minimum width, height, and number of openings at each location, and the location and maximum spacing of falsework lighting, if required for each opening, shall conform to the requirements in the table. The width of vehicular openings shall be the clear width between temporary railings or other protective work. The spacing shown for falsework pavement lighting is the maximum distance center to center in meters between fixtures.



Yerba Buena Island Westbound and Eastbound Transition  
Structures  
(Bridge No. 34-0006L/R)  
Over USCG Access Road

	Number	Width	Height
Vehicle Openings	2	12.2	4.6
	Location	Spacing	
Falsework Pavement Lighting	R and L	7 Staggered 1/2 Space	

(Width and Height in meters)

(R = Right side of traffic. L = Left side of traffic)

(C = Centered overhead)

The exact location of openings will be determined by the Engineer.

Closures are only allowed during the hours shown in the lane requirement charts included in this section "Maintaining Traffic," except for work required under Sections 7-1.08, "Public Convenience," and Section 7-1.09, "Public Safety."

The full width of the traveled way shall be open for use by public traffic when construction operations are not actively in progress.

The closure of the westbound Route 80 off-ramp (Left) to the Yerba Buena Island will be allowed for one 25 day period in order to perform construction operations in the vicinity that require closure of the ramp. Closure of this ramp shall be restricted to when public traffic will be least inconvenienced and delayed, as determined by the Engineer.

The Contractor shall notify the United States Coast Guard (USCG) at (415) 399-3504, at least 14 working days before work begins. The Contractor shall cooperate with USCG to handle traffic on WB-80 off-ramp, roadway connector from WB-80 off ramp to Hillcrest Road, Torpedo Factory Rd. and Macalla Rd., which lead to USCG Access Rd., through the work area, and shall make arrangements to keep the work area clear of parked vehicles.

Attention is directed to "Bridge Tolls" of these special provisions. The access of the Contractor's trucks hauling material and surplus materials to and from the project site, from westbound Route 80, westbound and eastbound on and off-ramps to and from Treasure Island/Yerba Buena Island, shall not be allowed during the peak periods from 5:00 a.m. to 10:00 a.m., and 3:00 p.m. to 7:00 p.m., on weekdays. Furthermore, the access of the Contractor's trucks hauling materials to the project site from westbound Route 80 through the bus and carpool lanes, at San Francisco-Oakland Bay Bridge toll plaza, shall not be allowed during the peak periods from 5:00 a.m. to 10:00 a.m., and 3:00 p.m. to 7:00 p.m., on weekdays.

The Contractor may use the existing SFOBB East Bay (Br. No. 33-0025) for hauling materials to and from the project site for a period of 360 days commencing on the day the existing San Francisco-Oakland Bay Bridge is closed to public traffic.

The Contractor is encouraged to organize carpool, vanpool, boat, or other modes of mass transit for transport of manpower, materials and equipment to the maximum extent practical, from San Francisco/Oakland to and from the project site.

Attention is directed to "Cooperation," of these special provisions.

The Contractor shall provide access and maintain Macalla Rd., roadway connector from WB-80 off to Hillcrest Road, and Torpedo Factory Rd., which are the primary access to USCG, United States Navy facilities, University of California-Berkeley (UCB) Seismographic Stations, and other contractors to various project sites on Yerba Buena Island, in the vicinity of the contract, at all times.

The Contractor shall provide and maintain a 3.6 m lane access road to Sanitary Sewer Lift Pump Station, at all times. The Contractor shall submit a written request for an approval from San Francisco Public Utilities Commission through the Engineer at least 96 hours in advance for any construction operation that may block the access road to the Sanitary Sewer Lift Pump Station.

Full compensation for providing and maintaining the above access shall be considered as included in the contract price paid for various items of work involved and no additional compensation will be allowed therefor.

Personal vehicles of the Contractor's employees shall not be parked on the traveled way or shoulders including sections closed to public traffic.

Personal vehicles of the Contractor's employees shall not be parked within the right of way on the traveled way or shoulders including any section closed to public traffic, except in the area proposed by the Contractor and approved by the Engineer. Vehicles parked outside the areas designated as Temporary Construction Easements will be ticketed by local parking authorities.

When work vehicles or equipment are parked on the shoulder within 1.8 m of a traffic lane, the shoulder area shall be closed as shown on the plans.

If minor deviations from the lane requirement charts are required, a written request shall be submitted to the Engineer at least 15 days before the proposed date of the closure. The Engineer may approve the deviations if there is no significant increase in the cost to the State and if the work can be expedited and better serve the public traffic.

Designated legal holidays are: January 1st, the third Monday in February, the last Monday in May, July 4th, the first Monday in September, November 11th, Thanksgiving Day, and December 25th. When a designated legal holiday falls on a Sunday, the following Monday shall be a designated legal holiday.

Special Days are: the third Monday in January, February 12th, March 31st, the second Monday in October, and any day on which a major event is scheduled at Candlestick Park, AT&T Park, downtown San Francisco, Treasure Island, O.co Coliseum, or downtown Oakland.

Lane Closure Restriction for Designated Legal Holidays and Special Days										
Thu	Fri	Sat	Sun	Mon	Tues	Wed	Thu	Fri	Sat	Sun
x	<b>H</b> xx	xx	xx							
	<b>SD</b> xx									
x	xx	<b>H</b> xx	xx							
		<b>SD</b> xx								
	x	xx	<b>H</b> xx	xx						
			<b>SD</b> xx							
	x	xx	xx	<b>H</b> xx						
	x	xx	xx	<b>SD</b> xx						
				x	<b>H</b> xx					
				x	<b>SD</b> xx					
					x	<b>H</b> xx				
						<b>SD</b> xx				
						x	<b>H</b> xx	xx		xx
							<b>SD</b> xx			
Legends:										
	Refer to lane closure charts									
X	The full width of the traveled way shall be open for use by public traffic after 4:30 a.m.									
xx	The full width of the traveled way shall be open for use by public traffic.									
<b>H</b>	Designated Legal Holiday									
<b>SD</b>	Special Day									

<b>Chart No. 1</b>																										
<b>Freeway Lane Requirements and Hours of Work</b>																										
County: San Francisco/Alameda						Route/Direction: 80 Eastbound						KP: 11.3/13.7														
Closure Limits: Between Treasure Island and left off-ramp (KP 12.4) and SFOBB Toll Plaza																										
FROM HOUR TO HOUR		24	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
Mondays through Thursdays		2	2	1	1	1	2	4																		3
Fridays		3	2	2	1	1	2	4																		
Saturdays		4	4	3	3	1	2	2	3	3																
Sundays		4	3	3	2	1	1	2	2	3	4														4	3
<p>Legend:</p> <div style="border: 1px solid black; padding: 2px; margin-bottom: 5px;">1</div> Provide at least one through freeway lane open in direction of travel <div style="border: 1px solid black; padding: 2px; margin-bottom: 5px;">2</div> Provide at least two adjacent through freeway lanes open in direction of travel <div style="border: 1px solid black; padding: 2px; margin-bottom: 5px;">3</div> Provide at least three adjacent through freeway lanes open in direction of travel <div style="border: 1px solid black; padding: 2px; margin-bottom: 5px;">4</div> Provide at least four adjacent through freeway lanes open in direction of travel <div style="border: 1px solid black; padding: 2px; margin-bottom: 5px;"></div> Work permitted within project right of way where shoulder or lane closure is not required.																										
REMARKS:																										

<b>Chart No. 2</b>																										
<b>Freeway Lane Requirements and Hours of Work</b>																										
County: San Francisco/Alameda						Route/Direction: 80 Westbound						KP: 11.3/13.7														
Closure Limits: Between Treasure Island and left off-ramp (KP 12.4) and SFOBB Toll Plaza																										
FROM HOUR TO HOUR		24	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
Mondays through Thursdays																										
Fridays																										
Saturdays																										
Sundays		2	2	2	2	2	2	2	2																	2
<p>Legend:</p> <div style="border: 1px solid black; padding: 2px; margin-bottom: 5px;">2</div> Provide at least two adjacent through freeway lanes open in direction of travel <div style="border: 1px solid black; padding: 2px; margin-bottom: 5px;"></div> Work permitted within project right of way where shoulder or lane closure is not required.																										
<p>REMARK:</p> <p>This chart shall be used only three times during the West Tie-in, Phase 3 of the project.</p>																										

<b>Chart No. 3</b>																										
<b>Freeway Lane Requirements and Hours of Work</b>																										
County: San Francisco/Alameda						Route/Direction: 80 Westbound										KP: 11.3/13.7										
Closure Limits: Between east end of SFOBB and Treasure Island on-ramp (KP 12.3)																										
FROM HOUR TO HOUR		24	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
Mondays through Thursdays		2	1	1	1	2																	4	4	4	3
Fridays		2	1	1	1	2																		4	4	3
Saturdays		2	2	1	1	1	2	3	4																	4
Sundays		2	2	1	1	1	2	2	3	3														4	4	3
<p>Legend:</p> <div style="border: 1px solid black; padding: 2px; margin-bottom: 5px;">1</div> Provide at least one through freeway lane open in direction of travel <div style="border: 1px solid black; padding: 2px; margin-bottom: 5px;">2</div> Provide at least two adjacent through freeway lanes open in direction of travel <div style="border: 1px solid black; padding: 2px; margin-bottom: 5px;">3</div> Provide at least three adjacent through freeway lanes open in direction of travel <div style="border: 1px solid black; padding: 2px; margin-bottom: 5px;">4</div> Provide at least four adjacent through freeway lanes open in direction of travel <div style="border: 1px solid black; padding: 2px; margin-bottom: 5px;"></div> Work permitted within project right of way where shoulder or lane closure is not required.																										
REMARKS:																										

<b>Chart No. 4</b>																										
<b>Complete Ramp Closure Hours/Ramp Lane Requirements</b>																										
County: San Francisco						Route/Direction: 80 Westbound										KP: 12.6										
Closure Limits: Treasure Island left off-ramp before the Yerba Buena Tunnel																										
FROM HOUR TO HOUR		24	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
Mondays through Thursdays																										
Fridays																										
Saturdays																										
Sundays			C	C	C	C	C	C	C	C	C	C														
<p>Legend:</p> <div style="border: 1px solid black; padding: 2px; margin-bottom: 5px;">C</div> Ramp may be closed completely <div style="border: 1px solid black; padding: 2px; margin-bottom: 5px;"></div> Work permitted within project right of way where shoulder or lane closure is not required.																										
<p>REMARK:</p> <p>This chart shall be used only three times.</p>																										

<b>Chart No. 5</b>																																							
<b>Complete Ramp Closure Hours/Ramp Lane Requirements</b>																																							
County: San Francisco														Route/Direction: 80 Westbound										KP: 12.6															
Closure Limits: Treasure Island left off-ramp before the Yerba Buena Tunnel																																							
FROM HOUR TO HOUR														24	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
Mondays through Thursdays																																							
Fridays																																							
Saturdays																																							
Sundays																	C	C	C	C	C	C	C																
<p>Legend:</p> <div style="display: flex; margin-bottom: 10px;"> <div style="border: 1px solid black; width: 20px; height: 15px; display: inline-block; margin-right: 5px;"></div> <div>C Ramp may be closed completely</div> </div> <div style="display: flex;"> <div style="border: 1px solid black; width: 20px; height: 15px; display: inline-block; margin-right: 5px;"></div> <div>Work permitted within project right of way where shoulder or lane closure is not required.</div> </div>																																							
<p>REMARK:</p> <p>This chart shall be used only three times.</p>																																							

<b>Chart No. 6</b>																																							
<b>Complete Ramp Closure Hours/Ramp Lane Requirements</b>																																							
County: San Francisco														Route/Direction: 80 Eastbound										KP: 12.8															
Closure Limits: Treasure Island on-ramp after the Yerba Buena Tunnel																																							
FROM HOUR TO HOUR														24	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
Mondays through Thursdays																																							
Fridays																																							
Saturdays																																							
Sundays														C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C				
<p>Legend:</p> <div style="display: flex; margin-bottom: 10px;"> <div style="border: 1px solid black; width: 20px; height: 15px; display: inline-block; margin-right: 5px;"></div> <div>C Ramp may be closed completely</div> </div> <div style="display: flex;"> <div style="border: 1px solid black; width: 20px; height: 15px; display: inline-block; margin-right: 5px;"></div> <div>Work permitted within project right of way where shoulder or lane closure is not required.</div> </div>																																							
<p>REMARK:</p> <p>This chart shall be used only one time.</p>																																							

<b>Chart No. 7</b> <b>Complete Ramp Closure Hours/Ramp Lane Requirements</b>																									
County: San Francisco								Route/Direction: 80 Eastbound								KP: 12.6									
Closure Limits: Treasure Island off-ramp after the Yerba Buena Tunnel																									
FROM HOUR TO HOUR		24 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24																							
Mondays through Thursdays		C	C	C	C	C	C																		C
Fridays																									
Saturdays																									
Sundays																									
Legend:  <div style="display: flex; align-items: center; margin-bottom: 5px;"> <div style="border: 1px solid black; width: 20px; height: 15px; display: flex; align-items: center; justify-content: center; margin-right: 5px;">C</div> Ramp may be closed completely </div> <div style="display: flex; align-items: center; margin-bottom: 5px;"> <div style="border: 1px solid black; width: 20px; height: 15px; display: flex; align-items: center; justify-content: center; margin-right: 5px;"></div> Work permitted within project right of way where shoulder or lane closure is not required. </div>																									
REMARK: This chart shall be used only three times.																									

Precast concrete members shall not be cast within the right of way of Route 80.

Erection and removal of falsework at locations where falsework openings are required shall be undertaken one location at a time. During falsework erection and removal, public traffic in the lanes over which falsework is being erected or removed shall be detoured or stopped as specified in this section, "Maintaining Traffic." Falsework erection shall include adjustments or removal of components that contribute to the horizontal stability of the falsework system. Falsework removal shall include lowering falsework, blowing sand from sand jacks, turning screws on screw jacks, and removing wedges.

The Contractor shall have necessary materials and equipment on the site to erect or remove the falsework in any one span or over any one opening before detouring or stopping public traffic.

#### 10-1.43 CLOSURE REQUIREMENTS AND CONDITIONS

Closures shall conform to the provisions in "Maintaining Traffic" of these special provisions and these special provisions.

The Engineer will have the authority to disapprove any closure schedule request, deny or abort any closure on any portion of the traveled way, when deemed necessary for the safe and efficient operation of public traffic or when necessary to resolve conflicts in closure schedules among Contractors or other State forces performing work within the State right of way

Attention is directed to "Cooperation," of these special provisions, regarding other Contractors' activities, and State forces during the progress of the work under this contract.

#### CLOSURE SCHEDULE

By noon Monday, the Contractor shall submit a written schedule of planned closures for the following week period, defined as Sunday noon through the following Sunday noon. Closures involving work (temporary barrier placement and paving operations) that will reduce horizontal clearances, traveled way inclusive of shoulders, to 2 lanes or less shall be submitted not less than 25 days and not more than 125 days before the anticipated start of operation. Closures involving work (pavement overlay, overhead sign installation, falsework and girder erection) that will reduce the vertical clearances available to the public, shall be submitted not less than 25 days and not more than 125 days before the anticipated start of operation.

The Closure Schedule shall show the locations and times of the proposed closures. The Closure Schedule request forms furnished by the Engineer shall be used. Closure Schedules submitted to the Engineer with incomplete or inaccurate information will be rejected and returned for correction and resubmittal. The Contractor will be notified of disapproved closures or closures that require coordination with other parties as a condition of approval.

Closure Schedule amendments, including adding additional closures, shall be submitted by noon to the Engineer, in writing, at least 3 business days in advance of a planned closure. Approval of Closure Schedule amendments will be at the discretion of the Engineer.

The Engineer shall be notified of cancelled closures 2 business days before the date of closure.  
Closures that are cancelled due to unsuitable weather may be rescheduled at the discretion of the Engineer.

### **CONTINGENCY PLAN**

A detailed contingency plan shall be prepared for reopening closures to public traffic. If required by "Beginning of Work, Time of Completion and Liquidated Damages" of these special provisions, the contingency plan shall be submitted to the Engineer before work at the job site begins. Otherwise, the contingency plan shall be submitted to the Engineer within one business day of the Engineer's request.

### **LATE REOPENING OF CLOSURES**

If a closure is not reopened to public traffic by the specified time, work shall be suspended in conformance with the provisions in Section 8-1.05, "Temporary Suspension of Work," of the Standard Specifications. No further closures are to be made until the Engineer has accepted a work plan, submitted by the Contractor, that will insure that future closures will be reopened to public traffic at the specified time. The Engineer will have 2 business days to accept or reject the Contractor's proposed work plan. The Contractor will not be entitled to compensation for the suspension of work resulting from the late reopening of closures.

For each 10-minute interval, or fraction thereof past the time specified to reopen the closure, the Department will deduct the amount per interval from moneys due or that may become due the Contractor under the contract. Damages are limited to 5 percent of project cost per occurrence and will not be assessed when the Engineer requests that closures remain in place beyond the scheduled pickup time.

Type of Facility	Route or Segment	Period	Damages/Interval (\$)
Mainline	80	1st half hour	\$4,300 / 10 minutes
		2nd half hour	\$6,400 / 10 minutes
		2nd hour and beyond	\$8,500 / 10 minutes
Ramps	80	1st half hour	\$4,300 / 10 minutes
		2nd half hour	\$6,400 / 10 minutes
		2nd hour and beyond	\$8,500 / 10 minutes

### **COMPENSATION**

The Engineer shall be notified of delays in the Contractor's operations due to the following conditions, and if, in the opinion of the Engineer, the Contractor's controlling operation is delayed or interfered with by reason of those conditions, and the Contractor's loss due to that delay could not have been avoided by rescheduling the affected closure or by judicious handling of forces, equipment and plant, the delay will be considered a right of way delay and will be compensated in conformance with the provisions in Section 8-1.09, "Right of Way Delays," of the Standard Specifications:

1. The Contractor's proposed Closure Schedule is denied and his planned closures are within the time frame allowed for closures in "Maintaining Traffic" of these special provisions, except that the Contractor will not be entitled to compensation for amendments to the Closure Schedule that are not approved.
2. The Contractor is denied a confirmed closure.

Should the Engineer direct the Contractor to remove a closure before the time designated in the approved Closure Schedule, delay to the Contractor's schedule due to removal of the closure will be considered a right of way delay and compensation for the delay will be determined in conformance with the provisions in Section 8-1.09, "Right of Way Delays," of the Standard Specifications.

### **10-1.44 IMPACT ATTENUATOR VEHICLE**

#### **GENERAL**

##### **Summary**

Work includes protecting traffic and workers by using impact attenuator vehicle as a shadow vehicle when placing and removing components of a traffic control system, and when performing a moving lane closure.

Comply with Section 12-3.03, "Flashing Arrow Signs," of the Standard Specifications.

Impact attenuator vehicle must comply with the following test levels under National Cooperative Highway Research Program 350:

1. Test level 3 for pre-construction posted speed limit of 80 km/hr or more
2. Test levels 2 or 3 for pre-construction posted speed limit of 70 km/hr or less

Comply with the attenuator manufacturer's recommendations for:

1. Support truck
2. Trailer-mounted operation
3. Truck-mounted operation

### **Definitions**

**impact attenuator vehicle:** Support truck towing a deployed attenuator mounted to a trailer or support truck with a deployed attenuator mounted to the support truck.

### **Submittals**

Upon request, submit a Certificate of Compliance for attenuator to the Engineer under Section 6-1.07, "Certificates of Compliance," of the Standard Specifications.

### **Quality Control and Assurance**

Attenuator must be a brand listed on the Department's pre-approved list at:

[http://www.dot.ca.gov/hq/esc/approved\\_products\\_list/HighwaySafe.htm](http://www.dot.ca.gov/hq/esc/approved_products_list/HighwaySafe.htm)

### **MATERIALS**

The combined mass of the support truck and the attenuator must be at least 9000 kg, except the mass of the support truck must not be less than 7300 kg or greater than 12000 kg.

If using the Trinity MPS-350 truck-mounted attenuator, the support truck must not have any underneath fuel tank mounted within 3.2 m of the rear of the support truck.

Each impact attenuator vehicle must:

1. Have standard brake lights, taillights, sidelights, and turn signals
2. Have an inverted "V" chevron pattern placed across the entire rear of the attenuator composed of alternating 100 mm wide non-reflective black stripes and 100 mm wide yellow retroreflective stripes sloping at 45 degrees
3. Have a Type II flashing arrow sign
4. Have a flashing or rotating amber light
5. Have an operable 2-way communication system for maintaining contact with workers

### **CONSTRUCTION**

Use impact attenuator vehicle to follow behind equipment and workers who are placing and removing components of a traffic control system for a lane closure or a ramp closure. Flashing arrow sign must be operating in arrow mode during this activity. Follow at a distance to prevent intrusion into the workspace from passing traffic.

After placing components of a traffic control system for a lane closure or a ramp closure you may use impact attenuator vehicle in a closed lane and in advance of a work area to protect traffic and workers.

Use impact attenuator vehicle as a shadow vehicle under traffic control for a moving lane closure.

Secure objects including equipment, tools and ballast on impact attenuator vehicle to prevent loosening upon impact by an errant vehicle.

Do not use a damaged attenuator in the work. Replace, at your expense, an attenuator damaged from an impact during work.

### **MEASUREMENT AND PAYMENT**

Full compensation for furnishing and operating impact attenuator vehicle is included in the contract lump sum price paid for traffic control system, and no additional compensation will be allowed therefor.

### **10-1.45 TRAFFIC CONTROL SYSTEM FOR LANE CLOSURE**

A traffic control system shall consist of closing traffic lanes in conformance with the details shown on the plans, the provisions in Section 12, "Construction Area Traffic Control Devices," of the Standard Specifications, the



provisions under "Maintaining Traffic" and "Construction Area Signs" of these special provisions, and these special provisions.

The provisions in this section will not relieve the Contractor of responsibility for providing additional devices or taking measures as may be necessary to comply with the provisions in Section 7-1.09, "Public Safety," of the Standard Specifications.

During traffic stripe operations and pavement marker placement operations using bituminous adhesive, traffic shall be controlled, at the option of the Contractor, with either stationary or moving lane closures. During other operations, traffic shall be controlled with stationary lane closures. Attention is directed to the provisions in Section 84-1.04, "Protection From Damage," and Section 85-1.06, "Placement," of the Standard Specifications.

If components in the traffic control system are displaced or cease to operate or function as specified, from any cause, during the progress of the work, the Contractor shall immediately repair the components to the original condition or replace the components and shall restore the components to the original location.

### **STATIONARY LANE CLOSURE**

When lane closures are made for work periods only, at the end of each work period, components of the traffic control system, except portable delineators placed along open trenches or excavation adjacent to the traveled way, shall be removed from the traveled way and shoulder. If the Contractor so elects, the components may be stored at selected central locations, designated by the Engineer within the limits of the highway right of way.

Each vehicle used to place, maintain and remove components of a traffic control system on multilane highways shall be equipped with a Type II flashing arrow sign which shall be in operation when the vehicle is being used for placing, maintaining or removing the components. Vehicles equipped with Type II flashing arrow sign not involved in placing, maintaining or removing the components when operated within a stationary type lane closure shall only display the caution display mode. The sign shall be controllable by the operator of the vehicle while the vehicle is in motion. The flashing arrow sign shown on the plans shall not be used on the vehicles which are doing the placing, maintaining and removing of components of a traffic control system and shall be in place before a lane closure requiring the sign's use is completed.

The traffic cones shown to be placed transversely across closed traffic lanes and shoulders on the plans entitled "Traffic Control System for Lane Closures on Freeways and Expressways" and "Traffic Control System for Lane and Complete Closures on Freeways and Expressways" shall not be placed.

### **MOVING LANE CLOSURE**

Flashing arrow signs used in moving lane closures shall be truck-mounted. Changeable message signs used in moving lane closure operations shall conform to the provisions in Section 12-3.12, "Portable Changeable Message Signs," of the Standard Specifications, except the signs shall be truck-mounted and the full operation height of the bottom of the sign may be less than 2.1 m above the ground, but should be as high as practicable.

Truck-mounted attenuators (TMA) for use in moving lane closures shall be any of the following approved models, or equal:

1. Hexfoam TMA Series 3000, Alpha 1000 TMA Series 1000, and Alpha 2001 TMA Series 2001, manufactured by Energy Absorption Systems, Inc., 35 East Wacker Drive, Suite 1100, Chicago, IL 60601:
  - 1.1. Northern California: Traffic Control Service, Inc., 8585 Thys Court, Sacramento, CA 95828, telephone (800) 884-8274, FAX (916) 387-9734
  - 1.2. Southern California: Traffic Control Service, Inc., 1818 E. Orangethorpe, Fullerton, CA 92831-5324, telephone (800) 222-8274, FAX (714) 526-9501
2. Cal T-001 Model 2 or Model 3, manufacturer and distributor: Hexcel Corporation, 11711 Dublin Boulevard, P.O. Box 2312, Dublin, CA 94568, telephone (925) 551-4900
3. Renco Rengard Model Nos. CAM 8-815 and RAM 8-815, manufacturer and distributor: Renco Inc., 1582 Pflugerville Loop Road, P.O. Box 730, Pflugerville, TX 78660-0730, telephone (800) 654-8182

Each TMA shall be individually identified with the manufacturer's name, address, TMA model number, and a specific serial number. The names and numbers shall each be a minimum 13 mm high and located on the left (street) side at the lower front corner. The TMA shall have a message next to the name and model number in 13 mm high letters which states, "The bottom of this TMA shall be \_\_\_\_\_ mm  $\pm$  \_\_\_\_\_ mm above the ground at all points for proper impact performance." Any TMA which is damaged or appears to be in poor condition shall not be used unless recertified by the manufacturer. The Engineer shall be the sole judge as to whether used TMAs supplied

under this contract need recertification. Each unit shall be certified by the manufacturer to meet the requirements for TMA in conformance with the standards established by the Transportation Laboratory.

Approvals for new TMA designs proposed as equal to the above approved models shall be in conformance with the procedures (including crash testing) established by the Transportation Laboratory. For information regarding submittal of new designs for evaluation contact: Transportation Laboratory, 5900 Folsom Boulevard, Sacramento, California 95819.

New TMAs proposed as equal to approved TMAs or approved TMAs determined by the Engineer to need recertification shall not be used until approved or recertified by the Transportation Laboratory.

## **PAYMENT**

The contract lump sum price paid for traffic control system shall include full compensation for furnishing all labor, materials (including signs), tools, equipment, and incidentals, and for doing all the work involved in placing, removing, storing, maintaining, moving to new locations, replacing and disposing of the components of the traffic control system shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

The adjustment provisions in Section 4-1.03, "Changes," of the Standard Specifications shall not apply to the item of traffic control system. Adjustments in compensation for traffic control system will be made only for increased or decreased traffic control system required by changes ordered by the Engineer and will be made on the basis of the cost of the increased or decreased traffic control necessary. The adjustment will be made on a force account basis as provided in Section 9-1.03, "Force Account Payment," of the Standard Specifications for increased work and estimated on the same basis in the case of decreased work.

Traffic control system required by work which is classed as extra work, as provided in Section 4-1.03D of the Standard Specifications, will be paid for as a part of the extra work.

### **10-1.46 TEMPORARY PAVEMENT DELINEATION (ROUTE 80)**

Temporary pavement delineation shall be furnished, placed, maintained, and removed in conformance with the provisions in Section 12-3.01, "General," of the Standard Specifications and these special provisions. Nothing in these special provisions shall be construed as reducing the minimum standards specified in the California MUTCD or as relieving the Contractor from the responsibilities specified in Section 7-1.09, "Public Safety," of the Standard Specifications, and these special provisions.

Painted traffic stripe used for temporary pavement delineation for eastbound and westbound Route 80 for the polyester concrete overlay operations shall be paint one-coat, detail 11, as shown on plan sheet A20A of the Standard Plans, and shall conform to "Paint Traffic Stripe and Pavement Marking," of these special provisions.

## **GENERAL**

When the work causes obliteration of pavement delineation, temporary or permanent pavement delineation shall be in place before opening the traveled way to public traffic. Laneline or centerline pavement delineation shall be provided for traveled ways open to public traffic. On multilane roadways (freeways and expressways), edgeline delineation shall be provided for traveled ways open to public traffic.

Work necessary, including required lines or markers, to establish the alignment of temporary pavement delineation shall be performed by the Contractor. Surfaces to receive application of paint or removable traffic tape temporary pavement delineation shall be dry and free of dirt and loose material. Temporary pavement delineation shall not be applied over existing pavement delineation or other temporary pavement delineation. Temporary pavement delineation shall be maintained until superseded or replaced with a new pattern of temporary pavement delineation or permanent pavement delineation, or as determined by the Engineer.

Temporary pavement markers and removable traffic tape that conflicts with a new traffic pattern or that is applied to the final layer of surfacing or existing pavement to remain in place shall be removed when no longer required for the direction of public traffic, as determined by the Engineer.

Temporary pavement delineation shall be used on or adjacent to lanes open to public traffic for a maximum of 14 days. Before the end of the 14 days, the permanent pavement delineation shall be placed. If the permanent pavement delineation is not placed within the 14 days, additional temporary pavement delineation shall be provided by the Contractor at no additional cost to the Department. The additional temporary pavement delineation to be provided shall be equivalent to the pattern specified for the permanent pavement delineation for the area, as determined by the Engineer.

Painted traffic stripe used for temporary delineation shall conform to "Paint Traffic Stripe and Pavement Marking" of these special provisions, except for payment. The number of coats shall be, at the option of the Contractor, either one or 2 coats. The quantity of painted traffic stripe used for temporary delineation will not be included in the quantities of paint traffic stripe to be paid for.

## **TEMPORARY LANELINE AND CENTERLINE DELINEATION**

When lanelines or centerlines are obliterated, the minimum laneline and centerline delineation to be provided shall be temporary pavement markers placed at longitudinal intervals of not more than 7.3 m. The temporary pavement markers shall be the same color as the laneline or centerline the markers replace. Temporary pavement markers shall be, at the option of the Contractor, one of the temporary pavement markers listed for short term day/night use (14 days or less) or long term day/night use (6 months or less) in "Prequalified and Tested Signing and Delineation Materials" of these special provisions. Temporary pavement markers shall be placed in conformance with the manufacturer's instructions and shall be cemented to the surfacing with the adhesive recommended by the manufacturer, except epoxy adhesive shall not be used to place pavement markers in areas where removal of the markers will be required.

Temporary laneline or centerline delineation consisting entirely of temporary pavement markers shall be placed on longitudinal intervals of not more than 7.3 m.

Where removal of white 100-mm wide laneline traffic stripe will not be required, painted traffic stripe and clear retroreflective pavement markers shall be used for temporary laneline delineation. Temporary painted laneline delineation placed on portland cement concrete pavement shall consist of white traffic stripe supplemented by black contrast traffic stripe and clear retroreflective pavement markers, as shown on the plans. Temporary painted laneline and clear retroreflective pavement markers shall be placed on longitudinal intervals of not more than 14.6 m. When the permanent pavement delineation is placed the black contrast stripe and clear retroreflective pavement markers may remain in place. The quantity of painted traffic stripe used for temporary laneline delineation will not be included in the quantities of paint traffic stripe to be paid for.

Full compensation for furnishing, placing, maintaining, and removing temporary pavement markers used for temporary laneline and centerline delineation and for providing equivalent patterns of permanent traffic lines for these areas when required shall be considered as included in the contract prices paid for the items of work that obliterated the laneline and centerline pavement delineation and no separate payment will be made therefor.

Full compensation for furnishing, placing, and maintaining temporary painted laneline and centerline pavement delineation shall be considered as included in the contract prices paid for the items of work that obliterated the laneline and centerline pavement delineation and no separate payment will be made therefor.

## **TEMPORARY EDGELINE DELINEATION**

When edgelines are obliterated on multilane roadways (freeways and expressways), the edgeline delineation to be provided for that area adjacent to lanes open to public traffic shall consist of, at the option of the Contractor, either solid 100-mm wide traffic stripe tape of the same color as the stripe it replaces, traffic cones, portable delineators or channelizers placed at longitudinal intervals not to exceed 30 m. Where removal of the 100-mm wide traffic stripe will not be required, painted traffic stripe may be used.

Temporary removable construction grade striping and pavement marking tape shall be as listed in "Prequalified and Tested Signing and Delineation Materials" of these special provisions. Temporary removable construction grade striping and pavement marking tape when used shall be applied in conformance with the manufacturer's recommendations.

The lateral offset for traffic cones, portable delineators or channelizers used for temporary edgeline delineation shall be determined by the Engineer. If traffic cones or portable delineators are used as temporary pavement delineation for edgelines, the Contractor shall provide personnel to remain at the project site to maintain the cones or delineators during hours of the day that the cones or delineators are in use.

Channelizers used for temporary edgeline delineation shall be the surface mounted type and shall be orange in color. Channelizer bases shall be cemented to the pavement in the same manner provided for cementing pavement markers to pavement in "Pavement Markers" of these special provisions, except epoxy adhesive shall not be used to place channelizers on the top layer of pavement. Channelizers shall be, at the Contractor's option, one of the surface mount types (900 mm) listed in "Prequalified and Tested Signing and Delineation Materials" of these special provisions.

Temporary edgeline delineation shall be removed when no longer required for the direction of public traffic, as determined by the Engineer.

Full compensation for furnishing, placing, maintaining, and removing temporary edgeline delineation shall be considered as included in the contract prices paid for the items of work that obliterated the edgeline pavement delineation and no separate payment will be made therefor. The quantity of channelizers used as temporary edgeline delineation will not be included in the quantity of channelizer (surface mounted) to be paid for.

#### **10-1.47 TEMPORARY PAVEMENT DELINEATION**

Temporary pavement delineation for local streets shall be furnished, placed, maintained, and removed in conformance with the provisions in Section 12-3.01, "General," of the Standard Specifications and these special provisions. Nothing in these special provisions shall be construed as reducing the minimum standards specified in the California MUTCD or as relieving the Contractor from the responsibilities specified in Section 7-1.09, "Public Safety," of the Standard Specifications.

##### **GENERAL**

When the work causes obliteration of pavement delineation, temporary or permanent pavement delineation shall be in place before opening the traveled way to public traffic. Laneline or centerline pavement delineation shall be provided for traveled ways open to public traffic.

The Contractor shall perform the work necessary to establish the alignment of temporary pavement delineation, including required lines or markers. Surfaces to receive application of paint or removable traffic tape temporary pavement delineation shall be dry and free of dirt and loose material. Temporary pavement delineation shall not be applied over existing pavement delineation or other temporary pavement delineation. Temporary pavement delineation shall be maintained until superseded or replaced with a new pattern of temporary pavement delineation or permanent pavement delineation, or as determined by the Engineer.

Temporary pavement markers, including underlying adhesive, and removable traffic tape that are applied to the final layer of surfacing or existing pavement to remain in place or that conflicts with a subsequent or new traffic pattern for the area shall be removed when no longer required for the direction of public traffic, as determined by the Engineer.

##### **TEMPORARY LANELINE AND CENTERLINE DELINEATION**

When lanelines or centerlines are obliterated and temporary pavement delineation to replace the lines is not shown on the plans, the minimum laneline and centerline delineation to be provided for that area shall be temporary pavement markers placed at longitudinal intervals of not more than 7.3 m. The temporary pavement markers shall be the same color as the laneline or centerline the pavement markers replace. Temporary pavement markers shall be, at the option of the Contractor, one of the temporary pavement markers listed for short term day/night use (14 days or less) or long term day/night use (180 days or less) in "Prequalified and Tested Signing and Delineation Materials" of these special provisions. The temporary pavement markers shall be placed in conformance with the manufacturer's instructions. Temporary pavement markers for long term day/night use (180 days or less) shall be cemented to the surfacing with the adhesive recommended by the manufacturer, except epoxy adhesive shall not be used to place the temporary pavement markers in areas where removal of the temporary pavement markers will be required.

Temporary laneline or centerline delineation consisting entirely of temporary pavement markers listed for short term day/night use (14 days or less), shall be placed on longitudinal intervals of not more than 7.3 m and shall be used for a maximum of 14 days on lanes opened to public traffic. Before the end of the 14 days the permanent pavement delineation shall be placed. If the permanent pavement delineation is not placed within the 14 days, the Contractor shall replace the temporary pavement markers and provide additional temporary pavement delineation and shall bear the cost thereof. The additional temporary pavement delineation to be provided shall be equivalent to the pattern specified for the permanent pavement delineation for the area, as determined by the Engineer.

Where "no passing" centerline pavement delineation is obliterated, the following "no passing" zone signing shall be installed before opening the lanes to public traffic. W20-1 (ROAD WORK AHEAD) signs shall be installed from 300 m to 600 m in advance of "no passing" zones. R4-1 (DO NOT PASS) signs shall be installed at the beginning and at every 600-m interval within "no passing" zones. For continuous zones longer than 3 km, W7-3a or W71(CA) (NEXT \_\_\_\_\_ MILES) signs shall be installed beneath the W20-1 signs installed in advance of "no passing" zones. R4-2 (PASS WITH CARE) signs shall be installed at the end of "no passing" zones. The exact location of "no passing" zone signing will be as determined by the Engineer and shall be maintained in place until permanent "no passing" centerline pavement delineation has been applied. The signing for "no passing" zones, shall be removed when no longer required for the direction of public traffic. The signing for "no passing" zones shall conform to the provisions in "Construction Area Signs" of these special provisions, except for payment.

##### **TEMPORARY TRAFFIC STRIPE (TAPE)**

The temporary traffic stripe tape shall be complete in place at the location shown before opening the traveled way to public traffic.

Removable traffic stripe tape shall be the temporary removable traffic stripe tape as listed in "Prequalified and Tested Signing and Delineation Materials" of these special provisions.

Removable traffic stripe tape shall be applied in conformance with the manufacturer's installation instructions and shall be rolled slowly with a rubber tired vehicle or roller to ensure complete contact with the pavement surface. Traffic stripe tape shall be applied straight on tangent alignment and on a true arc on curved alignment. Traffic stripe tape shall not be applied when the air or pavement temperature is less than 10°C, unless the installation procedures to be used are approved by the Engineer, before beginning installation of the tape.

#### **TEMPORARY PAVEMENT MARKING (TAPE)**

Temporary pavement marking consisting of removable pavement marking tape shall be applied at the locations shown on the plans. The temporary pavement marking tape shall be complete in place at the location shown, before opening the traveled way to public traffic.

Removable pavement marking tape shall be the temporary removable type pavement marking tape listed in "Prequalified and Tested Signing and Delineation Materials" of these special provisions and shall be applied and removed in conformance with the provisions specified for applying and removing the temporary traffic stripe tape.

#### **TEMPORARY PAVEMENT MARKING (PAINT)**

Temporary pavement marking consisting of painted pavement marking shall be applied and maintained at the locations shown on the plans. The painted temporary pavement marking shall be complete in place at the location shown before opening the traveled way to public traffic. Removal of painted temporary pavement marking will not be required.

Temporary painted pavement marking shall conform to the provisions in "Paint Traffic Stripe and Pavement Marking" of these special provisions, except for payment. At the option of the Contractor, either one or 2 coats shall be applied regardless whether on new or existing pavement.

At the Contractor's option, temporary removable pavement marking tape or permanent pavement marking tape listed in "Prequalified and Tested Signing and Delineation Materials" of these special provisions may be used instead of painted temporary pavement markings. When pavement marking tape is used, regardless of which type of tape is placed, the tape will be measured and paid for by the square meter as temporary pavement marking (paint).

#### **TEMPORARY PAVEMENT MARKERS**

Temporary pavement markers shall be applied complete in place before opening the traveled way to public traffic.

Temporary pavement markers shall be, at the option of the Contractor, one of the temporary pavement markers for long term day/night use (180 days or less) listed in "Prequalified and Tested Signing and Delineation Materials" of these special provisions.

Temporary pavement markers shall be placed in conformance with the manufacturer's instructions and shall be cemented to the surfacing with the adhesive recommended by the manufacturer, except epoxy adhesive shall not be used in areas where removal of the pavement markers will be required.

Retroreflective pavement markers conforming to the provisions in "Pavement Markers" of these special provisions may be used in place of temporary pavement markers for long term day/night use (180 days or less) except to simulate patterns of broken traffic stripe. Placement of the retroreflective pavement markers used for temporary pavement markers shall conform to the provisions in "Pavement Markers" of these special provisions except the waiting period provisions before placing the pavement markers on new hot mix asphalt surfacing as specified in Section 85-1.06, "Placement," of the Standard Specifications shall not apply and epoxy adhesive shall not be used to place pavement markers in areas where removal of the pavement markers will be required.

#### **MEASUREMENT AND PAYMENT**

Temporary traffic stripe and temporary pavement marking shown on the plans will be measured and paid for in the same manner specified for paint traffic stripe and paint pavement marking in Section 84-3.06, "Measurement," and Section 84-3.07, "Payment," of the Standard Specifications.

Temporary pavement markers shown on the plans will be measured and paid for by the unit in the same manner specified for retroreflective pavement markers in Section 85-1.08, "Measurement," and Section 85-1.09, "Payment," of the Standard Specifications.

Full compensation for furnishing, placing, maintaining, and removing the temporary pavement markers (including underlying adhesive, layout (dribble) lines to establish alignment of temporary pavement markers or used for temporary laneline and centerline delineation and signing specified for "no passing" zones) for those areas where temporary laneline and centerline delineation is not shown on the plans and for providing equivalent patterns of permanent traffic lines for those areas when required, shall be considered as included in the contract prices paid for the items of work that obliterated the laneline and centerline pavement delineation and no separate payment will be made therefor.

Full compensation for furnishing, placing, maintaining, and removing temporary edgeline delineation not shown on the plans shall be considered as included in the contract prices paid for the items of work that obliterated the edgeline pavement delineation and no separate payment will be made therefor. The quantity of channelizers used as temporary edgeline delineation will not be included in the quantity of channelizer (surface mounted) to be paid for.

#### **10-1.48 BARRICADE**

Barricades shall be furnished, placed and maintained at the locations shown on the plans, specified in the Standard Specifications or in these special provisions or where designated by the Engineer. Barricades shall conform to the provisions in Section 12, "Construction Area Traffic Control Devices," of the Standard Specifications and these special provisions.

Attention is directed to "Prequalified and Tested Signing and Delineation Materials" of these special provisions regarding retroreflective sheeting for barricades.

Construction area sign and marker panels conforming to the provisions in Section 12-3.06, "Construction Area Signs," of the Standard Specifications shall be installed on barricades in a manner determined by the Engineer at the locations shown on the plans.

Sign panels for construction area signs and marker panels installed on barricades shall conform to the provisions in Section 12-3.06A, "Stationary Mounted Signs," of the Standard Specifications.

Full compensation for furnishing, installing, maintaining, and removing construction area signs and marker panels on barricades shall be considered as included in the contract unit price paid for the type of barricade involved and no separate payment will be made therefor.

Barricades shown on the plans as part of a traffic control system will be paid for as provided in "Traffic Control System for Lane Closure" of these special provisions and will not be included in the count for payment of barricades.

#### **10-1.49 PORTABLE CHANGEABLE MESSAGE SIGNS**

##### **GENERAL**

##### **Summary**

Work includes furnishing, placing, operating, maintaining, and removing portable changeable message signs. Comply with Section 12-3.12 "Portable Changeable Message Signs," of the Standard Specifications.

##### **Definitions**

**useable shoulder area:** Paved or unpaved contiguous surface adjacent to the traveled way with:

1. Sufficient weight bearing capacity to support portable changeable message sign
2. Slope not greater than 1:6 (vertical:horizontal)

##### **Submittals**

Upon request, submit a Certificate of Compliance for each portable changeable message sign under Section 6-1.07, "Certificates of Compliance," of the Standard Specifications.

##### **Quality Control and Assurance**

Comply with the manufacturer's operating instructions for portable changeable message sign.

Approaching drivers must be able to read the entire message for all phases at least twice at the posted speed limit before passing portable changeable message sign. You may use more than 1 portable changeable message sign to meet this requirement.

Only display the message shown on the plans or ordered by the Engineer or specified in these special provisions.

##### **MATERIALS**

Portable changeable message sign must have 24-hour timer control or remote control capability.

The text of the message displayed on portable changeable message sign must not scroll, or travel horizontally or vertically across the face of the message panel.

##### **CONSTRUCTION**

Continuously repeat the entire message in no more than 2 phases of at least 3 seconds per phase.

If useable shoulder area is at least 4.6 m wide, the displayed message on portable changeable message sign must be minimum 450 mm character height. If useable shoulder area is less than 4.6 m wide, you may use a smaller message panel with minimum 300 mm character height to prevent encroachment in the traveled way.

Start displaying the message on portable changeable message sign 40 minutes before closing the lane.

Place portable changeable message sign in advance of the first warning sign for:

1. Each stationary lane closure
2. Each off-ramp closure
3. Each connector closure
4. Each shoulder closure
5. Each speed reduction zone

For 5 days starting on the day of signal activation, place 1 portable changeable message sign in each direction of travel and display the message, "SIGNAL AHEAD -- PREPARE TO STOP."

Place portable changeable message sign as far from the traveled way as practicable where it is legible to traffic and does not encroach on the traveled way. Place portable changeable sign before or at the crest of vertical roadway curvature where it is visible to approaching traffic. Avoid placing portable changeable message sign within or immediately after horizontal roadway curvature. Where possible, place portable changeable message sign behind guardrail or temporary railing (Type K).

Except where placed behind guardrail or temporary railing (Type K) use traffic control for shoulder closure to delineate portable changeable message sign.

Remove portable changeable message sign when not in use.

## **MEASUREMENT AND PAYMENT**

Full compensation for portable changeable message signs, including furnishing, placing, operating, modifying messages, maintaining, transporting from location to location, removing, and repairing or replacing defective or damaged portable changeable message signs is included in the contract lump sum price paid for traffic control system and no separate payment will be made therefor.

### **10-1.50 TEMPORARY RAILING**

Temporary railing (Type K) shall be placed as shown on the plans, as specified in the Standard Specifications or these special provisions or where ordered by the Engineer and shall conform to the provisions in Section 12, "Construction Area Traffic Control Devices," of the Standard Specifications and these special provisions.

Temporary railing (Type K) shall be secured in place before starting work for which the temporary railing is required.

Reflectors on temporary railing (Type K) shall conform to the provisions in "Prequalified and Tested Signing and Delineation Materials" of these special provisions.

Temporary railing (Type K) placed in conformance with the provisions in "Public Safety" of these special provisions will be neither measured nor paid for.

### **10-1.51 CHANNELIZER**

Channelizers shall conform to the provisions in Section 12, "Construction Area Traffic Control Devices," of the Standard Specifications and these special provisions.

Channelizers shall conform to the provisions in "Prequalified and Tested Signing and Delineation Materials" of these special provisions.

### **10-1.52 TEMPORARY CRASH CUSHION MODULE**

This work shall consist of furnishing, installing, and maintaining sand filled temporary crash cushion modules in groupings or arrays at each location shown on the plans, as specified in these special provisions or where designated by the Engineer. The grouping or array of sand filled modules shall form a complete sand filled temporary crash cushion in conformance with the details shown on the plans and these special provisions.

Temporary crash cushions shall be secured in place prior to commencing work for which the temporary crash cushions are required.

Whenever the work or the Contractor's operations establishes a fixed obstacle, the exposed fixed obstacle shall be protected with a sand filled temporary crash cushion. The sand filled temporary crash cushion shall be in place prior to opening the lanes adjacent to the fixed obstacle to public traffic.

Sand filled temporary crash cushions shall be maintained in place at each location, including times when work is not actively in progress. Sand filled temporary crash cushions may be removed during a work period for access to

the work provided that the exposed fixed obstacle is 4.6 m or more from a lane carrying public traffic and the temporary crash cushion is reset to protect the obstacle prior to the end of the work period in which the fixed obstacle was exposed. When no longer required, as determined by the Engineer, sand filled temporary crash cushions shall be removed from the site of the work.

Sand filled temporary crash cushion modules shall be one of the following, or equal, and be manufactured after March 31, 1997:

1. Energite III and Fitch Inertial Modules, manufactured by Energy Absorption Systems, Inc., 35 East Wacker Drive, Suite 1100, Chicago, IL 60601:
  - 1.1. Northern California: Traffic Control Service, Inc., 8585 Thys Court, Sacramento, CA 95828, telephone (800) 884-8274, FAX (916) 387-9734
  - 1.2. Southern California: Traffic Control Service, Inc., 1818 E. Orangethorpe, Fullerton, CA 92831-5324, telephone (800) 222-8274, FAX (714) 526-9501
2. Traffix Sand Barrels, manufactured by Traffix Devices, Inc., 220 Calle Pintoresco, San Clemente, CA 92672, telephone (949) 361-5663, FAX (949) 361-9205
  - 2.1. Northern California: United Rentals, Inc., 1533 Berger Drive, San Jose, CA 95112, telephone (408) 287-4303, FAX (408) 287-1929
  - 2.2. Southern California: Statewide Safety & Sign, Inc., P.O. Box 1440, Pismo Beach, CA 93448, telephone (800) 559-7080, FAX (805) 929-5786
3. CrashGard Model CC-48 Sand Barrels, manufactured by Plastic Safety Systems, Inc., 2444 Baldwin Road, Cleveland, OH 44104:
  - 3.1. Northern California:
    - 3.1.1. Capitol Barricade Safety & Sign, 6329 Elvas Ave, Sacramento, CA 95819, telephone (888) 868-5021, FAX (916) 451-5388
    - 3.1.2. Sierra Safety, Inc., 9093 Old State Highway, New Castle, CA 95658, telephone (916) 663-2026, FAX (916) 663-1858
  - 3.2. Southern California: Hi Way Safety Inc., 13310 5th Street, Chino, CA 91710, telephone (909) 591-1781, FAX (909) 627-0999

Modules contained in each temporary crash cushion shall be of the same type at each location. The color of the modules shall be the standard yellow color, as furnished by the vendor, with black lids. The modules shall exhibit good workmanship free from structural flaws and objectionable surface defects. The modules need not be new. Good used undamaged modules conforming to color and quality of the types specified herein may be utilized. If used Fitch modules requiring a seal are furnished, the top edge of the seal shall be securely fastened to the wall of the module by a continuous strip of heavy duty tape.

Modules shall be filled with sand in conformance with the manufacturer's directions, and to the sand capacity in pounds for each module shown on the plans. Sand for filling the modules shall be clean washed concrete sand of commercial quality. At the time of placing in the modules, the sand shall contain not more than 7 percent water as determined by California Test 226.

Modules damaged due to the Contractor's operations shall be repaired immediately by the Contractor at the Contractor's expense. Modules damaged beyond repair, as determined by the Engineer, due to the Contractor's operations shall be removed and replaced by the Contractor at the Contractor's expense.

Temporary crash cushion modules may be placed on movable pallets or frames. Comply with dimensions shown on the plans. The pallets or frames shall provide a full bearing base beneath the modules. The modules and supporting pallets or frames shall not be moved by sliding or skidding along the pavement or bridge deck.

A Type R or P marker panel shall be attached to the front of the crash cushion as shown on the plans, when the closest point of the crash cushion array is within 3.6 m of the traveled way. The marker panel, when required, shall be firmly fastened to the crash cushion with commercial quality hardware or by other methods determined by the Engineer.

At the completion of the project, temporary crash cushion modules, sand filling, pallets or frames, and marker panels shall become the property of the Contractor and shall be removed from the site of the work. Temporary crash cushion modules shall not be installed in the permanent work.



Temporary crash cushion modules will be measured by the unit as determined from the actual count of modules used in the work or ordered by the Engineer at each location. Temporary crash cushion modules placed in conformance with Section 7-1.09, "Public Safety," of the Standard Specifications and modules placed in excess of the number specified or shown will not be measured nor paid for.

Repairing modules damaged by public traffic will be paid for as extra work as provided in Section 4-1.03D of the Standard Specifications. Modules damaged beyond repair by public traffic, when ordered by the Engineer, shall be removed and replaced immediately by the Contractor. Modules replaced due to damage by public traffic will be measured and paid for as temporary crash cushion module.

If the Engineer orders a lateral move of the sand filled temporary crash cushions and the repositioning is not shown on the plans, moving the sand filled temporary crash cushion will be paid for as extra work as provided in Section 4-1.03D of the Standard Specifications and these temporary crash cushion modules will not be counted for payment in the new position.

The contract unit price paid for temporary crash cushion module shall include full compensation for furnishing all labor, materials (including sand, pallets or frames and marker panels), tools, equipment, and incidentals, and for doing all the work involved in furnishing, installing, maintaining, moving, and resetting during a work period for access to the work, and removing from the site of the work when no longer required (including those damaged by public traffic) sand filled temporary crash cushion modules, complete in place, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

### **10-1.53 EXISTING HIGHWAY FACILITIES**

The work performed in connection with various existing highway facilities shall conform to the provisions in Section 15, "Existing Highway Facilities," of the Standard Specifications and these special provisions.

Except as otherwise provided for damaged materials in Section 15-2.04, "Salvage," of the Standard Specifications, the materials to be salvaged, as specified in "Removing, Reinstalling or Salvaging Electrical Equipment," of these special provisions, shall remain the property of the State, and shall be cleaned, packaged, bundled, tagged, and hauled to the District Electrical Maintenance Station, 30 Rickard Street, San Francisco, CA 94134, (415) 330-6509 and stockpiled.

Existing footing concrete which is below ground and outside of the footing limits shown on the contract plans or original contract plans shall be removed as directed by the Engineer and such work will be paid for as extra work as provided in Section 4-1.03D, "Extra Work," of the Standard Specifications.

### **EXISTING PAINT SYSTEMS**

The existing paint systems on Bridge Number 33-0025 consist of red lead, zinc and chlorinated rubber undercoats and phenolic aluminum and water based finish coats. The existing paint systems on South-South Detour Viaduct and East Tie-In structure (Bridge Number 34-0006) contain zinc. Any work that disturbs the existing paint system will expose workers to health hazards and will (1) produce debris containing heavy metal in amounts that exceed the thresholds established in Titles 8 and 22 of the California Code of Regulations or (2) produce toxic fumes when heated. All debris produced when the existing paint system is disturbed shall be contained.

#### **Debris Containment and Collection Program**

Prior to starting work, the Contractor shall submit a debris containment and collection program to the Engineer in conformance with the provisions in "Working Drawings," of these special provisions, for debris produced when the existing paint system is disturbed. The program shall identify materials, equipment, and methods to be used when the existing paint system is disturbed and shall include working drawings of containment systems, loads applied to the bridge by containment structures, and provisions for ventilation and air movement for visibility and worker safety.

If the measures being taken by the Contractor are inadequate to provide for the containment and collection of debris produced when the existing paint system is disturbed, the Engineer will direct the Contractor to revise the operations and the debris containment and collection program. The directions will be in writing and will specify the items of work for which the Contractor's debris containment and collection program is inadequate. No further work shall be performed on the items until the debris containment and collection program is adequate and, if required, a revised program has been approved for the containment and collection of debris produced when the existing paint system is disturbed.

The Engineer will notify the Contractor of the approval or rejection of the submitted or revised debris containment and collection program within 2 weeks of submittal of the Contractor's program or revised program.

The State will not be liable to the Contractor for failure to approve all or any portion of an originally submitted or revised debris containment and collection program, nor for delays to the work due to the Contractor's failure to submit an acceptable program.

Full compensation for the debris containment and collection program shall be considered as included in the contract price paid for the item of work causing the existing paint system to be disturbed, and no additional compensation will be allowed therefor.

### **Safety and Health Provisions**

Attention is directed to Section 7-1.06, "Safety and Health Provisions," of the Standard Specifications. Work practices and worker health and safety shall conform to the California Code of Regulations, Title 8, Construction Safety Orders, including Section 1532.1, "Lead."

The Contractor shall furnish the Engineer a written Code of Safe Practices and shall implement an Injury and Illness Prevention Program and a Hazard Communication Program in conformance with the requirements of Construction Safety Orders, Sections 1509 and 1510.

Prior to starting work that disturbs the existing paint system, and when revisions to the program are required by Section 1532.1, "Lead," the Contractor shall submit the compliance programs required in subsection (e)(2), "Compliance Program," of Section 1532.1, "Lead," of the Construction Safety Orders to the Engineer in conformance with the provisions in "Working Drawings" of these special provisions. The compliance programs shall include the data specified in subsections (e)(2)(B) and (e)(2)(C) of Section 1532.1, "Lead." Approval of the compliance programs by the Engineer will not be required. The compliance programs shall be reviewed and signed by a Certified Industrial Hygienist (CIH) who is certified in comprehensive practice by the American Board of Industrial Hygiene (ABIH). Copies of all air monitoring or jobsite inspection reports made by or under the direction of the CIH in conformance with Section 1532.1, "Lead," shall be furnished to the Engineer within 10 days after the date of monitoring or inspection.

Full compensation for furnishing the Engineer with the submittals and for implementing the programs required by this safety and health section shall be considered as included in the contract price paid for the item of work causing the existing paint system to be disturbed, and no additional compensation will be allowed therefor.

### **Debris Handling**

Debris produced when the existing paint system is disturbed shall not be temporarily stored on the ground or discharged to surface waters. Debris accumulated inside the containment system shall be removed before the end of each work shift. Debris shall be stored in approved, leakproof containers and shall be handled in such a manner that no spillage will occur.

Disposal of debris produced when the existing paint system is disturbed shall be performed in conformance with all applicable Federal, State, and Local hazardous waste laws. Laws that govern this work include:

- A. Health and Safety Code, Division 20, Chapter 6.5 (California Hazardous Waste Control Act).
- B. Title 22; California Code of Regulations, Division 4.5, (Environmental Health Standards for the Management of Hazardous Waste).
- C. Title 8, California Code of Regulations.

Except as otherwise provided herein, debris produced when the existing paint system is disturbed shall be disposed of by the Contractor at an approved Class 1 disposal facility in conformance with the requirements of the disposal facility operator. The debris shall be hauled by a transporter currently registered with the California Department of Toxic Substances Control using correct manifesting procedures and vehicles displaying current certification of compliance. The Contractor shall make all arrangements with the operator of the disposal facility and perform any testing of the debris required by the operator.

At the option of the Contractor, the debris produced when the existing paint system is disturbed may be disposed of by the Contractor at a facility equipped to recycle the debris, subject to the following requirements:

- A. Copper slag abrasive blended by the supplier with a calcium silicate compound shall be used for blast cleaning.
- B. The debris produced when the existing paint system is disturbed shall be tested by the Contractor to confirm that the solubility of the heavy metals is below regulatory limits and that the debris may be transported to the recycling facility as a non-hazardous waste.
- C. The Contractor shall make all arrangements with the operator of the recycling facility and perform any testing of the debris produced when the existing paint system is disturbed that is required by the operator.

Full compensation for debris handling and disposal shall be considered as included in the contract price paid for the item of work causing the existing paint system to be disturbed, and no additional compensation will be allowed therefor.

### **Work Area Monitoring**

The Contractor shall perform work area monitoring of the ambient air and soil in and around the work area at the bridge site to verify the effectiveness of the containment system. The work area monitoring shall consist of collecting, analyzing, and reporting air and soil test results and recommending the required corrective action when specified exposure levels are exceeded. The work area monitoring shall be carried out under the direction of a CIH. The samples shall be collected at locations designated by the Engineer.

Air samples shall be collected and analyzed in conformance with National Institute for Occupational Safety and Health (NIOSH) methods. Air samples for lead detection shall be collected and analyzed in conformance with NIOSH Method 7082, with a limit of detection of at least  $0.5 \mu\text{g}/\text{m}^3$ . Air samples for detection of other metals shall be collected and analyzed in conformance with NIOSH Method 7300, with a limit of detection of at least one percent of the appropriate Permissible Exposure Limits (PELs) specified by the California/Occupational Safety and Health Administration (Cal/OSHA). Alternative methods of sample collection and analysis, with equivalent limits of detection, may be used at the option of the Contractor.

The airborne metals exposure, outside either the containment system or work areas, shall not exceed the lower of either: (1) 10 percent of the Action Level specified for lead by Section 1532.1, "Lead," of the Construction Safety Orders, or (2) 10 percent of the appropriate PELs specified for other metals by Cal/OSHA.

The air samples shall be collected at least once per week during progress of work that disturbs the existing paint system. All air samples shall be analyzed within 48 hours at a facility accredited by the Environmental Lead Laboratory Accreditation Program of the American Industrial Hygiene Association (AIHA). When corrective action is recommended by the CIH, additional samples may be required by the Engineer to be taken, at the Contractor's expense.

Four soil samples shall be collected prior to the start of work, and eight soil samples shall be collected within 36 hours following completion of cleaning operations of existing steel. Where the cleaning operations extend over large areas of soil or many separate areas of soil at each bridge site, the samples shall be collected at various times during the contract when determined by the Engineer. A soil sample shall consist of 5 plugs, each 19 mm in diameter and 13 mm deep, taken at each corner and center of a one square meter area. Soil samples shall be analyzed for total lead and zinc in conformance with Method 3050 in "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods," SW-846 published by the United States Environmental Protection Agency.

There shall be no increase in the concentrations of heavy metal in the soil in the area affected when the existing paint system is disturbed. When soil sampling, after completion of work that disturbs the existing paint system, shows an increase in the concentrations of heavy metal, the area affected shall be cleaned and resampled at the Contractor's expense until soil sampling and testing shows concentrations of heavy metal less than or equal to the concentrations collected prior to the start of work.

In areas where there is no exposed soil, there shall be no visible increase in the concentrations of heavy metal on the area affected when the existing paint system is disturbed. Any visible increase in the concentrations of heavy metal, after completion of work that disturbs the existing paint system, shall be removed at the Contractor's expense.

Air and soil sample laboratory analysis results, including results of additional samples taken after corrective action as recommended by the CIH, shall be submitted to the Engineer. The results shall be submitted both verbally within 48 hours after sampling and in writing with a copy to the Contractor, within 5 days after sampling. Sample analysis reports shall be prepared by the CIH as follows:

- A. For both air and soil sample laboratory analysis results, the date and location of sample collection, sample number, contract number, bridge number, full name of the structure as shown on the contract plans, and District-County-Route-Kilometer Post will be required.
- B. For air sample laboratory analysis results, the following will be required:
  - 1. List of emission control measures in place when air samples were taken.
  - 2. Air sample results shall be compared to the appropriate PELs.
  - 3. Chain of custody forms.
  - 4. Corrective action recommended by the CIH to ensure airborne metals exposure, outside either the containment system or work areas, is within specified limits.
- C. For soil sample laboratory analysis results, the concentrations of heavy metal expressed as parts per million will be required.

Work area monitoring will be paid for on the basis of a lump sum price.

The contract lump sum price paid for work area monitoring shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in collecting and analyzing samples of ambient air and soil for heavy metals, complete in place, including reporting the test results, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

### **Containment System**

At the option of the Contractor, the containment system shall consist of either (1) a ventilated containment structure, (2) vacuum shrouded surface preparation equipment and drapes, tarps, or other materials, or (3) an equivalent containment system. The containment system shall contain all water, resulting debris, and visible dust produced when the existing paint system is disturbed.

The containment system shall provide the clearances specified under "Maintaining Traffic" of these special provisions, except that when no clearances are specified a vertical clearance of 4.6 m and a horizontal clearance of 9.8 m shall be provided for the passage of public traffic.

Falsework or supports for the ventilated containment structure shall not encroach on the required clearances.

The ventilated containment structure shall conform to the provisions for falsework in Section 51-1.06, "Falsework," of the Standard Specifications.

The minimum total design load of the ventilated containment structure shall consist of the sum of the dead and live vertical loads. Dead load shall consist of the actual load of the ventilated containment structure. Live loads shall consist of a uniform load of not less than 2160 Pa, which includes 960 Pa of sand load, applied over the area supported, and in addition, a moving 4.5 kN concentrated load shall be applied to produce maximum stress in the main supporting elements. Assumed horizontal loads need not be included in the design of the ventilated containment structure.

The ventilated containment structure shall be supported with either rigid or flexible supports. The rigid or flexible containment materials on the containment structure shall retain airborne particles but may allow airflow through the containment materials. Flexible materials shall be supported and fastened to prevent escape of abrasive and blast materials due to whipping from traffic or wind and to maintain clearances.

All mating joints between the ventilated containment structure and the bridge shall be sealed. Sealing may be by overlapping of seams when using flexible materials or by using tape, caulking, or other sealing measures.

Multiple flap overlapping door tarps shall be used at entry ways to the ventilated containment structure to prevent dust or debris from escaping.

Baffles, louvers, flapper seals, or ducts shall be used at make-up air entry points to the ventilated containment structure to prevent escape of abrasives and resulting surface preparation debris.

The ventilated containment structure shall be properly maintained while work is in progress and shall not be changed from the approved working drawings without prior approval of the Engineer.

The ventilation system in the ventilated containment structure shall be of the forced input airflow type with fans or blowers.

Negative air pressure shall be employed within the ventilated containment structure and will be verified by visual methods by observing the concave nature of the containment materials while taking into account wind effects or by using smoke or other visible means to observe airflow. The input airflow shall be properly balanced with the exhaust capacity throughout the range of operations.

The exhaust airflow of the ventilation system in the ventilated containment structure shall be forced into dust collectors (wet or dry) or bag houses.

Full compensation for the containment system shall be considered as included in the contract price paid for the item of work causing the existing paint system to be disturbed, and no additional compensation will be allowed therefor.

### **Protective Work Clothing and Hygiene Facilities**

Wherever there is exposure or possible exposure to heavy metals or silica dust at the bridge site, the Contractor shall, for State personnel: (1) furnish, clean, and replace protective work clothing and (2) provide access to hygiene facilities. The furnishing, cleaning, and replacement of protective work clothing and providing access to hygiene facilities shall conform to the provisions of subsections (g), "Protective work clothing and equipment," and (i), "Hygiene facilities and practices," of Section 1532.1, "Lead," of the Construction Safety Orders, and will be required for no more than 3 people.

The protective work clothing and access to hygiene facilities shall be provided during exposure or possible exposure to heavy metals or silica dust at the bridge site and during the application of the undercoats of paint.

Protective work clothing and hygiene facilities shall be inspected and approved by the Engineer before being used by State personnel.

The protective work clothing shall remain the property of the Contractor at the completion of the contract.

Full compensation for protective work clothing and access to hygiene facilities for State personnel shall be considered as included in the contract price paid for the item of work causing the existing paint system to be disturbed, and no additional compensation will be allowed therefor.

### **REMOVE PIPE LINE**

Existing Navy pipelines, where shown on the plans to be removed, shall be completely removed and disposed of.

Existing Navy pipelines, which consist of water pipes with concrete casing, sewer pipes and service gas pipes with concrete casing are under the jurisdiction of the San Francisco Public Utilities Commission/Water Department (SFWD).

The Contractor shall notify in writing the Engineer and SFWD, at least 15 working days in advance before any work to be performed by SFWD forces for disconnecting, and connecting of the water pipe, and gas pipe. The Contractor shall confirm the scheduled work with the Engineer, and SFWD at (415)550-4956, at least 3 working days before the actual field work by SFWD.

Concrete casing removed shall be disposed of outside the highway right of way in conformance with the provisions in Section 7-1.13, "Disposal of Material Outside the Highway Right of Way," of the Standard Specifications.

### **SALVAGE BASKETBALL HOOP**

Existing basketball hoop, where shown on the plans to be salvaged, shall be removed and salvaged.

Basketball hoop shall be hauled to United States Coast Guard's yard and stockpiled.

### **SALVAGE PARKING CANOPY**

#### **General**

Existing parking canopy, where shown on the plans to be salvaged, shall be removed and salvaged to gain access to or for new work, in accordance with the details shown on the plans and these special provisions.

#### **Existing Parking Canopy**

The existing parking canopy consists of 11 panels with cold steel channel framing with bolt connection, corrugated metal wall, and corrugated metal roof on top of plywood.

1. Type of Building: Cold steel bolted framing and columns  
Column: Cold Steel Channel 305mm x 90mm x 3mm  
Beam: Cold Steel Channel 200mm x 75mm x 3mm
2. Roof Covering: Corrugated metal roof on top of Plywood
3. Total Building Area: 67.1 x 6.2, 416 square meters
4. How Used: Parking
5. Building Site (Plot) Area: Approximately 416 square meters.  
Detached Structures with asphalt concrete pavement parking lot,
6. Site Topographic Conditions: Level Lot
7. Utilities Present: No

### **CONSTRUCTION**

Comply with the provisions in Sections 7-1.11, "Preservation of Property," 7-1.16, "Contractor's Responsibility for the Work and Materials," and 8-1.10, "Utility and Non-Highway Facilities," of the Standard Specifications, and "Sound Control Requirements," of these special provisions.

Coordinate with the United States Coast Guard prior to beginning the salvage work.

Assemblies, that require dismantling for salvaging and hauling, shall be matchmarked before dismantling parking canopy.

Existing concrete foundation around the steel columns shall be completely removed and disposed of.

Salvaged materials shall remain the property of the United States Coast Guard and shall be hauled to and stockpiled at a new location within 2 kilometers of the United States Coast Guard property.

### **MEASUREMENT AND PAYMENT**

The contract lump sum price paid for salvage parking canopy shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in removing and salvaging

parking canopy including hauling and stockpiling, complete in place, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

Full compensation for removing and disposing of concrete foundation around the steel columns shall be considered as included in the contract lump sum price paid for salvage parking canopy and no separate payment will be made therefor.

#### **SALVAGE WOODEN GATE**

Existing wooden gate, where shown on the plans to be salvaged, shall be removed and salvaged.

Wooden gate shall be hauled to United States Coast Guard's yard and stockpiled.

#### **REMOVE METAL BEAM GUARD RAILING**

Existing metal beam guard railing, where shown on the plans to be removed, shall be removed and disposed of.

Full compensation for removing cable anchor assemblies, terminal anchor assemblies or steel foundation tubes shall be considered as included in the contract price paid per meter for remove metal beam guard railing and no separate payment will be made therefor.

#### **REMOVE PAVEMENT MARKER**

Existing pavement markers, including underlying adhesive, when no longer required for traffic lane delineation as determined by the Engineer, shall be removed and disposed of.

#### **REMOVE TRAFFIC STRIPE AND PAVEMENT MARKING**

This work includes removing existing traffic stripe and pavement marking at the locations shown on the plans.

Submit a lead compliance plan under Section 7-1.07, "Lead Compliance Plan," of the Standard Specifications.

Waste residue from removal of thermoplastic and painted traffic stripe and pavement marking is a non-hazardous waste residue and contains lead in average concentrations less than 1000 mg/kg total lead and 5 mg/L soluble lead. This waste residue does not contain heavy metals in concentrations that exceed thresholds established by the Health and Safety Code and 22 CA Code of Regs and is not regulated under the Federal Resource Conservation and Recovery Act (RCRA), 42 USC § 6901 et seq.

#### **REMOVE DRAINAGE FACILITY**

Existing culverts, flared end sections, and inlets where shown on the plans to be removed, shall be completely removed and disposed of.

#### **REMOVE ROADSIDE SIGN**

Existing roadside signs, at those locations shown on the plans to be removed, shall be removed and disposed of.

Existing roadside signs shall not be removed until replacement signs have been installed or until the existing signs are no longer required for the direction of public traffic, unless otherwise directed by the Engineer.

#### **REMOVE FIRE ALARM POST**

Existing fire alarm post, at those locations shown on the plans to be removed, shall be removed and disposed of.

#### **REMOVE FENCE**

Existing fence, including post footings, where shown on the plans to be removed, shall be removed and disposed of.

#### **RECONSTRUCT CANTILEVER SWING GATE (TYPE METAL)**

Existing cantilever swing gate (Type Metal) equipped electrically controlled gate operator and vehicle detection systems, at the locations shown on the plans, shall be removed and reconstructed at new location.

New electrically controlled gate operator including card key, and vehicle detection systems may be required for reconstructing cantilever swing gate (Type Metal).

If required, the new electrically controlled gate operator shall be a heavy duty gate operator from one of the following manufacturers:

1. Elite Access System Inc.  
25741 Commercentre Drive, Lake Forest, CA 92630  
Telephone No.: (949) 580-1700  
Model: CSW-200-UL-1HP-PK

2. Doorking, Inc.  
120 Glasgow Ave. Inglewood, CA 90301  
Telephone No.: (800) 826-7493  
Model 6300 – 1HP motor
3. Eagle Access Control Systems, Inc  
3133 Saticoy St. North Hollywood, CA 91605  
Telephone No.: (818) 764-6690  
Model Eagle 200-DM  
or equal

The gate shall have a control that allows the gate to be locked open.

Full compensation for finishing and installing new electrically controlled gate operator and vehicle detection systems for reconstructing cantilever swing gate (Type Metal) shall be considered as included in the contract unit price paid for reconstruct cantilever swing gate (Type Metal) and no separate payment will be made therefor.

Fence (Type Metal) removed in excess of that required for reconstructing cantilever swing gate (Type Metal) shall be disposed of.

Full compensation for removing and disposing of excess fence (Type Metal) shall be considered as included in the contract unit price paid for reconstruct cantilever swing gate (Type Metal) and no separate payment will be made therefor.

### **RECONSTRUCT TIMBER STAIR**

The work shall include removing, disassembling, stockpiling and reconstructing a portion of the existing timber stair including stairway electrical wiring and lighting in accordance with the details shown on the plans and these special provisions, in order to gain access for the construction of the gabion wall.

The timber stair shall be constructed in kind or better in conformance with the existing stair. As-built plans of the existing timber stair are available as part of Information Handout "Temporary Bypass Structure, Bridge No. 34-0006 TEMP As-Built: Viaduct, East Tie End, and West Tie End (Phase I and II)" in "Supplemental Project Information," of these special provisions.

Stairway electrical wiring and lighting within the reconstruction limits shall be removed to the nearest pull box, salvaged and reconstructed.

Stair lighting electrical work is provided for in Section 10-3, "Signals, Lighting and Electrical Systems," of these special provisions.

Damage to the existing timber stair outside of the work limit caused by the Contractor's operations shall be repaired or replaced at the Contractor's expense.

### **MEASUREMENT AND PAYMENT**

The contract lump sum price paid for reconstruct timber stair shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in reconstructing timber stair, complete in place, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

Full compensation for removing, salvaging and reconstructing stairway electrical wiring and lighting within the reconstruction limits shall be considered as included in the contract lump sum price paid for reconstruct timber stair and no separate payment will be made therefor.

### **RESET ROADSIDE SIGN**

Existing roadside signs, where shown on the plans to be reset, shall be removed and reset.

Each roadside sign shall be reset on the same day that the sign is removed.

Two holes shall be drilled in each existing post as required to provide the breakaway feature shown on the plans.

### **RELOCATE ROADSIDE SIGN**

Existing roadside signs shall be removed and relocated to the new locations shown on the plans.

Each roadside sign shall be installed at the new location on the same day that the sign is removed from its original location.

Two holes shall be drilled in each existing post as required to provide the breakaway feature shown on the plans.

## **ADJUST INLET**

Existing pipe inlets and concrete drainage inlets shall be adjusted as shown on the plans.

Concrete shall be minor concrete conforming to the provisions in Section 90-10, "Minor Concrete," of the Standard Specifications. The concrete shall contain not less than 350 kg of cementitious material per cubic meter.

Where inlets are located in areas to be paved or surfaced, no individual structure shall be constructed to final grade until the paving or surfacing has been completed immediately adjacent to the structure.

## **REMOVE BASE AND SURFACING**

Existing base and bituminous surfacing shown on the plans to be removed, shall be removed to a depth of at least 150 mm below the grade of the existing surfacing. Resulting holes and depressions shall be backfilled with earthy material selected from excavation to the lines and grade established by the Engineer.

The material removed shall be disposed of outside the highway right of way in conformance with the provisions in Section 15-2.03, "Disposal," of the Standard Specifications.

Removing base and surfacing will be measured by the cubic meter in the same manner specified for roadway excavation in conformance with the provisions in Section 19, "Earthwork," of the Standard Specifications and will be paid for at the contract price per cubic meter for remove base and surfacing.

## **COLD PLANE ASPHALT CONCRETE PAVEMENT**

Existing asphalt concrete pavement shall be cold planed at the locations and to the dimensions shown on the plans.

Planing asphalt concrete pavement shall be performed by the cold planing method. Planing of the asphalt concrete pavement shall not be done by the heater planing method.

Cold planing machines shall be equipped with a cutter head not less than 750 mm in width and shall be operated so that no fumes or smoke will be produced. The cold planing machine shall plane the pavement without requiring the use of a heating device to soften the pavement during or prior to the planing operation.

The depth, width, and shape of the cut shall be as shown on the plans or as designated by the Engineer. The final cut shall result in a uniform surface conforming to the plans. The outside lines of the planed area shall be neat and uniform. Planing asphalt concrete pavement operations shall be performed without damage to the surfacing to remain in place.

Planed widths of pavement shall be continuous except for intersections at cross streets where the planing shall be carried around the corners and through the conform lines. Following planing operations, a drop-off of more than 45 mm will not be allowed between adjacent lanes open to public traffic.

Where transverse joints are planed in the pavement at conform lines no drop-off shall remain between the existing pavement and the planed area when the pavement is opened to public traffic. If Hot Mix Asphalt (HMA) has not been placed to the level of existing pavement before the pavement is to be opened to public traffic a temporary HMA taper shall be constructed. HMA for temporary tapers shall be placed to the level of the existing pavement and tapered on a slope of 1:30 (Vertical: Horizontal) or flatter to the level of the planed area.

HMA for temporary tapers shall be the same quality as the HMA used elsewhere on the project or shall conform to the material requirements for minor HMA. HMA for tapers shall be compacted by any method that will produce a smooth riding surface. Temporary HMA tapers shall be completely removed, including the removal of loose material from the underlying surface, before placing the permanent surfacing. The removed material shall be disposed of outside the highway right of way in conformance with the provisions in Section 7-1.13, "Disposal of Material Outside the Highway Right of Way," of the Standard Specifications.

The material planed from the roadway surface, including material deposited in existing gutters or on the adjacent traveled way, shall be disposed of in conformance with the provisions in Section 7-1.13, "Disposal of Material Outside the Highway Right of Way," of the Standard Specifications. Removal operations of cold planed material shall be concurrent with planing operations and follow within 15 m of the planer, unless otherwise directed by the Engineer.

Cold plane asphalt concrete pavement will be measured by the square meter. The quantity to be paid for will be the actual area of surface cold planed irrespective of the number of passes required to obtain the depth shown on the plans.

The contract price paid per square meter for cold plane asphalt concrete pavement shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in cold planing asphalt concrete surfacing and disposing of planed material, including furnishing the HMA for and constructing, maintaining, removing, and disposing of temporary HMA tapers, as specified in the Standard Specifications and these special provisions and as directed by the Engineer.



### **ADJUST FRAME AND COVER TO GRADE (DUCT BANK MANHOLE)**

Frames and covers of existing manholes, junction structures or other facilities shall be adjusted to grade in conformance with the provisions in Section 15-2.05, "Reconstruction," of the Standard Specifications.

### **BRIDGE REMOVAL**

Removing bridges or portions of bridges shall conform to the provisions in Section 15-4, "Bridge Removal," of the Standard Specifications and these special provisions.

LOCATION A  
YBI EDGE BEAM SUPPORT STRUCTURE (YBIEBSS)  
(Bridge No. 34-0006)  
Remove portion of existing bridge foundation as shown on the plans.

LOCATION B  
WEST TIE-IN (DEMOLITION)  
(Bridge No. 34-0006)  
Remove the existing structure as shown on the plans.

LOCATION C  
SOUTH-SOUTH DETOUR VIADUCT (DEMOLITION)  
(Bridge No 34-0006 Temp)  
Remove the existing structure as shown on the plans

LOCATION D  
EAST TIE-IN (DEMOLITION)  
(Bridge No 34-0006)  
Remove the existing structure as shown on the plans

LOCATION E  
YBI EB ON-RAMP (FINAL)  
(Bridge No. 340006 S)  
Remove portions of existing retaining wall at Abutment W11 as shown on the plans.

LOCATION F  
YBI EB TRANSITION STRUCTURE (MOD)  
(Bridge No. 34-0006 R)  
Remove the existing Temporary Eastbound On-Ramp structure as shown on the plans.

LOCATION H  
YBI EDGE BEAM SUPPORT STRUCTURE ARCHITECTURAL EXTENSION  
(Bridge No. 34-0006 R)  
Remove portion of the existing concrete piles as shown on the plans.

Removed materials that are not to be salvaged or used in the reconstruction shall become the property of the Contractor and shall be disposed of in conformance with the provisions in Section 7-1.13, "Disposal of Material Outside the Highway Right of Way," of the Standard Specifications.

The Contractor shall submit a complete bridge removal plan to the Engineer for each bridge listed above, detailing procedures, sequences, and all features required to perform the removal in a safe and controlled manner.

The bridge removal plan shall include, but not be limited to the following:

- A. The removal sequence, including staging of removal operations.
- B. Equipment locations on the structure during removal operations.
- C. Temporary support shoring or temporary bracing.
- D. Locations where work is to be performed over traffic or utilities.
- E. Details, locations, and types of protective covers to be used.
- F. Measures to assure that people, property, utilities, and improvements will not be endangered.
- G. Details and measures for preventing material, equipment, and debris from falling onto public traffic, or US Coast Guard property.

When protective covers are required for removal of portions of a bridge, or when superstructure removal works on bridges are involved, the Contractor shall submit working drawings, with design calculations, to the Engineer for the proposed bridge removal plan, and the bridge removal plan shall be prepared and signed by an engineer who is registered as a Civil Engineer in the State of California. The design calculations shall be adequate to demonstrate the stability of the structure during all stages of the removal operations. Calculations shall be provided for each stage of bridge removal and shall include dead and live load values assumed in the design of protective covers. At a minimum, a stage will be considered to be removal of the deck, the soffit, or the girders, in any span; or walls, bent caps, or columns at support locations.

Temporary support shoring, temporary bracing, and protective covers, as required, shall be designed and constructed in conformance with the provisions in Section 51-1.06, "Falsework," of the Standard Specifications and these special provisions.

The assumed horizontal load to be resisted by the temporary support shoring and temporary bracing, for removal operations only, shall be the sum of the actual horizontal loads due to equipment, construction sequence or other causes, and an allowance for wind, but in no case shall the assumed horizontal load to be resisted in any direction be less than 5 percent of the total dead load of the structure to be removed.

The bridge removal plan shall conform to the provisions in "Working Drawings," of these special provisions. Calculations and working drawings shall be stamped by an engineer who is registered as a Civil Engineer in the State of California. The number of sets of drawings, design calculations and the time for reviewing bridge removal plans shall be the same as specified for falsework working drawings in Section 51-1.06A, "Falsework Design and Drawings," of the Standard Specifications.

The time to be provided for the Engineer's review of the bridge removal plans for removing specific structures, or portions thereof, shall be as follows:

Structure or Portion of Structure	Review Time - Weeks
West Tie-In	4
East Tie-In	4
South-South Detour Viaduct	10

The following additional requirements apply to the removal of bridges or portions of bridges that are over or adjacent to roadways that may be closed to public traffic for only brief periods of time:

- A. The closure of roadways to public traffic shall conform to the provisions in "Order of Work" and "Maintaining Traffic" of these special provisions.
- B. Prior to closing a roadway to traffic to accommodate bridge removal operations, the Contractor shall have all necessary workers, materials, and equipment at the site as needed to proceed with the removal work in an expeditious manner. While the roadway is closed to public traffic, work shall be pursued promptly and without interruption until the roadway is reopened to public traffic.
- C. Bridge removal operations shall be performed during periods of time that the roadway is closed to public traffic except as specified herein for preliminary work.
- D. Preliminary work shall be limited to operations that will not reduce the structural strength or stability of the bridge, or any element thereof, to a level that in the judgment of the Engineer would constitute a hazard to the public. This preliminary work shall also be limited to operations that cannot cause debris or any other material to fall onto the roadway. Protective covers may be used to perform preliminary work such as chipping or cutting the superstructure into segments, provided the covers are of sufficient strength to support all loads and are sufficiently tight to prevent dust and fine material from sifting down onto the traveled way. Protective covers shall extend at least 1.2 m beyond the limit of the work underway. Bottom slabs of box girders may be considered to be protective covers for preliminary work performed on the top slab inside the limits of the exterior girders.
- E. Temporary support shoring and temporary bracing shall be used in conjunction with preliminary work when necessary to insure the stability of the bridge.
- F. Temporary support shoring, temporary bracing, and protective covers shall not encroach closer than 2.4 m horizontally from the edge or 4.6 m vertically above any traffic lane or shoulder that is open to public traffic.
- G. During periods when the roadway is closed to public traffic, debris from bridge removal operations may be allowed to fall directly onto the lower roadway provided adequate protection is furnished for all highway facilities. The minimum protection for paved areas shall be a 0.6-m thick earthen pad or a 25-mm thick steel plate placed over the area where debris can fall. Prior to reopening the roadway to public traffic, all

debris, protective pads, and devices shall be removed and the roadway swept clean with wet power sweepers or equivalent methods.

- H. The removal operations shall be conducted in such a manner that the portion of the structure not yet removed remains in a stable condition at all times. For girder bridges, each girder shall be completely removed within a span before the removal of the adjacent girder is begun. For slab type bridges, removal operations within a span shall be performed along a front that roughly parallels the primary reinforcing steel.

The following additional requirements apply to the removal of bridges or portions of bridges whenever the removal work is to be performed over public traffic.

- A. A protective cover shall be constructed before beginning bridge removal work. The protective cover shall be supported by shoring, falsework, or members of the existing structure. The Contractor shall be responsible for designing and constructing safe and adequate protective covers, shoring, and falsework with sufficient strength and rigidity to support the entire load to be imposed.
- B. The construction and removal of the protective cover, and the installation and removal of temporary railings shall conform to the provisions in "Order of Work," "Maintaining Traffic," "Temporary Railings" of these special provisions.
- C. Bridge removal methods shall be described in the working drawings, supported by calculations with sufficient details to substantiate live loads used in the protective cover design. Dead and live load values assumed for designing the protective cover shall be shown on the working drawings.
- D. The protective cover shall prevent any materials, equipment, or debris from falling onto public traffic. The protective cover shall have a minimum strength equivalent to that provided by good, sound Douglas fir planking having a nominal thickness of 50 mm. Additional layers of material shall be furnished as necessary to prevent fine materials or debris from sifting down upon the traveled way and shoulders.
- E. During the removal of bridge segments, and when portions of the bridge, such as deck slabs or box girder slabs, comply with the requirements for the protective cover, a separate protective cover need not be constructed.
- F. At locations where entire girders are to be removed, the protective cover shall extend at least 3 m beyond the outside face of the bridge railing.
- G. The protective cover shall provide the openings specified under "Maintaining Traffic" of these special provisions, except that when no openings are specified for bridge removal, a vertical opening of 4.6 m and a horizontal opening of 9.8 m shall be provided for the passage of public traffic.
- H. The construction of the protective cover as specified herein shall not relieve the Contractor of responsibilities specified in Section 7-1.12A, "Indemnification," and Section 7-1.12B, "Insurance," of the Standard Specifications.
- I. Before removal of the protective cover, the Contractor shall clean the protective cover of all debris and fine material.

For bridge removal that requires the Contractor's registered engineer to prepare and sign the bridge removal plan, the Contractor's registered engineer shall be present at all times when bridge removal operations are in progress. The Contractor's registered engineer shall inspect the bridge removal operation and report in writing on a daily basis the progress of the operation and the status of the remaining structure. A copy of the daily report shall be available at the site of the work at all times. Should an unplanned event occur or the bridge operation deviate from the approved bridge removal plan, the Contractor's registered engineer shall submit immediately to the Engineer for approval, the procedure of operation proposed to correct or remedy the occurrence.

#### **REMOVE EPOXY ASPHALT CONCRETE SURFACING**

Existing epoxy asphalt concrete surfacing shall be removed to the top of existing portland cement concrete pavement as shown on the plans and as described in these special provisions.

The method of removal shall be selected by the Contractor. Equipment or procedures that damage the remaining concrete surface, as determined by the Engineer, shall not be used.

Cold milling equipment may be used to remove epoxy asphalt concrete surfacing.

If the Contractor elects to use cold milling equipment, the cold milling equipment shall have the capability to 1) remove concrete a minimum depth of 6 mm, 2) provide a surface relief of no more than 6 mm, and 3) maintain a 4-mm grade tolerance; and shall have the following features:

- A. 3 or 4 riding tracks.
- B. An automatic grade control system with an electronic averaging system having 3 sensors on each side of the equipment.
- C. A conveyer system that leaves no debris on the bridge.
- D. A drum that operates in an up-milling direction.
- E. Bullet tooth tools with tungsten carbide steel cutting tips.
- F. A 16-mm maximum tool spacing.
- G. A maximum operating mass of 25400 kg.

The Contractor shall select which sensors are activated during the milling operation to produce the profile required as shown on the plans.

The cold milling equipment shall have a complete set of new tooth tools at the beginning of the job, and the tooth tools shall be replaced as necessary to perform the work satisfactorily.

The Contractor shall provide personnel on each side of the milling drum to monitor the milling operation and maintain radio communication with the operator at all times during the milling operation.

The outline of the epoxy asphalt concrete to be removed shall be cut with a power-driven saw to a depth of not less than 50 mm before removing the surfacing. Surfacing shall be removed without damage to surfacing that is to remain in place. Any damage to pavement which is to remain in place shall be repaired to a condition satisfactory to the Engineer, or the damaged pavement shall be removed and replaced when ordered by the Engineer. Repairing or removing and replacing pavement damaged outside the limits of surfacing to be removed shall be at the Contractor's expense and will not be measured or paid for.

All removed materials shall become the property of the Contractor and shall be disposed of in conformance with the provisions in Section 7-1.13, "Disposal of Material Outside the Highway Right of Way," of the Standard Specifications.

Remove epoxy asphalt concrete surfacing will be measured by the square meter.

The contract price paid per square meter for remove epoxy asphalt concrete surfacing shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals and for doing all the work involved in removing epoxy asphalt concrete surfacing including saw cutting of epoxy asphalt concrete, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

### **REMOVE CONCRETE DECK SURFACE**

This work includes removing a portion of the portland cement concrete deck surface by high-pressure water jetting or cold milling.

The Contractor must submit plans and procedures for protecting the seismic joints in place during deck concrete removal operations in conformance with the provisions in "Working Drawings" of these special provisions.

#### **Construction**

High-pressure water jet equipment must:

- 1. Have rotating jets
- 2. Be rated at 200 MPa minimum

Water jetting residue must be removed after water jetting.

Cold milling equipment must be able to:

- 1. Remove concrete a minimum depth of 6 mm
- 2. Provide a surface relief of at most 6 mm
- 3. Provide a 4-mm grade tolerance

Cold milling equipment must have the following features:

- 1. 3 or 4 riding tracks
- 2. Automatic grade control system with electronic averaging having 3 sensors on each side of the equipment
- 3. Conveyer system that leaves no debris on the bridge
- 4. Drum that operates in an up-milling direction
- 5. Bullet tooth tools with tungsten carbide steel cutting tips
- 6. Maximum tool spacing of 6 mm
- 7. Maximum operating mass of 30,000 kg

8. Maximum track unit mass of 8,930 kg per meter
9. New tooth tools at the start of the job

Provide personnel on each side of the milling drum to monitor milling activities. Maintain constant radio communication with the operator during milling activities.

Sweep the deck surface. Blow the deck clean with high-pressure air. Remove 20 mm of deck surface.

Coarse aggregate remaining above the removal depth must be firmly embedded.

Dispose of removed materials under Section 7-1.13, "Disposal of Material Outside the Highway Right of Way," of the Standard Specifications.

#### **Measurement and Payment**

Remove concrete deck surface will be measured by the square meter of concrete deck surface removed based on plan dimensions.

The contract price paid per square meter for remove concrete deck surface includes full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in removing concrete deck surface, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

#### **PREPARE CONCRETE BRIDGE DECK SURFACE**

This work includes abrasive blast cleaning the concrete deck surface with steel shot and blowing the deck surface clean.

The Contractor must submit plans and procedures for protecting the seismic joints and bike path expansion joints in place during deck cleaning operations in conformance with the provisions in "Working Drawings" of these special provisions.

#### **Materials**

Steel shot must comply with SSPC-AB3. Recycled steel shot must comply with SSPC-AB2.

#### **Construction**

Abrasive blast clean the deck surface with steel shot. Remove all laitance, contaminants, and foreign material. Sweep the deck surface. Blow the deck surface clean using high-pressure air.

The deck must be dry when abrasive blast cleaning is performed.

Laitance, surface contaminants, and foreign material must be removed from the concrete deck surface.

If the deck surface becomes contaminated before placing the overlay, abrasive blast clean the contaminated area and sweep the deck clean.

Residue from abrasive blasting must be removed by a vacuum attachment operating concurrently with blasting equipment when abrasive blasting within 3 meters of public traffic.

Dispose of removed materials under Section 7-1.13, "Disposal of Material Outside the Highway Right of Way," of the Standard Specifications.

#### **Measurement and Payment**

Prepare concrete bridge deck surface is measured and paid for by the square meter of deck surface prepared.

The contract price paid per square meter for prepare concrete bridge deck surface includes full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in preparing the concrete bridge deck surface, and concrete bike path surface, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

#### **REMOVE CONCRETE**

Existing concrete retaining walls, concrete (slope paving), concrete drainage ditch, and concrete basketball court, and concrete stairs, where shown on the plans to be removed, shall be removed, and shall conform to the provisions in Section 15-3, "Removing Concrete," of the Standard Specifications and these special provisions.

The pay quantities of concrete to be removed will be measured by the cubic meter, measured before and during removal operations.

Full compensation for removing and hauling the structure backfill from removing concrete stairs shall be considered as included in the contract price paid by cubic meter for remove concrete stair and no additional compensation will be made therefor.

Concrete removed shall be disposed of outside the highway right of way in conformance with the provisions in Section 7-1.13, "Disposal of Material Outside the Highway Right of Way," of the Standard Specifications.

Concrete within construction limits, both inside and outside the highway right of way, shall be removed, except for curbs and sidewalks adjacent to frontage roads and through city streets.

Where no joint exists between concrete to be removed and concrete to remain in place, the concrete shall be cut on a neat line to a minimum depth of 50 mm with a power driven saw before the concrete is removed.

Where concrete has been removed outside the roadway prism, the backfilled areas shall be graded to drain and blend in with the surrounding terrain.

Concrete to be removed which has portions of the same structure both above and below ground will be considered as concrete above ground for compensation.

#### **REMOVE CONCRETE VAULT**

Concrete vault, where shown on the plans to be removed, shall be removed.

Concrete removed shall be disposed of outside the highway right of way in conformance with the provisions in Section 7-1.13, "Disposal of Material Outside the Highway Right of Way," of the Standard Specifications.

#### **REMOVE METAL STAIR**

Existing metal stair, where shown on the plans to be removed, shall be removed including the removal of the metal pipe handrailing and hardware.

Existing metal stair unit with steel pipe railing on both sides, and concrete pad to be removed shall be removed.

Concrete removed shall be disposed of outside the highway right of way in conformance with the provisions in Section 7-1.13, "Disposal of Material Outside the Highway Right of Way," of the Standard Specifications.

#### **RELOCATE PREFABRICATED BOOTH**

This work includes relocating and installing the existing prefabricated fiberglass booth equipped with air conditioning unit and equipment as shown on the plans, at the location within the United State Coast Guard (USCG) property as directed by the Engineer.

Comply with the provisions in Section 5-1.18, "Property and Facility Preservation," and Section 7, "Legal Relations and Responsibility," of the Standard Specifications.

Existing prefabricated fiberglass booth features are:

1. Type of Building: Fiber glass with 1.83 meters by 1.83 meters in size and 3.2 meters in height, on wooden support installed on existing asphalt concrete pavement
2. Roof Covering: Fiber glass
3. Total Building Area: 3.35 square meters
4. How Used: USCG Guard Booth
5. Contents: Air conditioning unit and equipment
6. Utilities Present: Electrical lighting system with key card reader

Electrical system servicing the prefabricated fiberglass booth shall be disconnected as directed by the Engineer, before the relocation of the facility.

Air conditioning unit and equipment, which are damaged by the Contractor's operations, shall be repaired or replaced at the Contractor's expense.

#### **MEASUREMENT AND PAYMENT**

The contract lump sum price paid for relocate prefabricated booth includes full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in relocating prefabricated booth, complete in place, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

#### **REMOVE CONCRETE BARRIER (TYPE K)**

Concrete barrier (Type K), where shown on the plans to be removed, shall be removed, and become the property of the Contractor.

Holes in the bridge deck caused by the removal of concrete barrier (Type K) shall be backfilled with grout materials equal to or better to match the existing deck surface.

Removing concrete barrier (Type K) will be measured by the meter before removal operations.

Full compensation for backfilling holes resulting from removing concrete barrier (Type K) shall be considered as included in the contract prices paid per meter for remove concrete barrier (Type K) and no additional compensation will be made therefor.

At the Contractor's option, removed concrete barrier (Type K) may be used as temporary railing (Type K) in conforming to the provisions in "Temporary Railing (Type K)," of these special provisions.

#### **REMOVE SOLDIER PILE WALL**

Existing soldier pile wall with timber lagging for earthwork support system, where shown on the plans to be removed when no longer required, shall be completely removed.

As-built plans of the existing soldier pile retaining wall with timber lagging for earthwork support system are available as information handout in "Supplemental Project Information," of these special provisions.

The resulting holes and depressions caused by the removal of the soldier pile wall including steel plate lagging shall be backfilled and compacted with material equivalent to the surrounding material and to the established grade shown on the plans. The structural backfill shall be compacted to a relative compaction of not less than 95%.

#### **MEASUREMENT AND PAYMENT**

Removing soldier pile wall will be measured by the meter, measured along the soldier pile retaining wall before removal operations.

The contract price paid per meter for remove soldier pile wall shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in removing soldier piles including timber lagging, complete in place, including structural backfilling and compacting the resulting holes, and depressions caused by the removal of the soldier pile wall, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

#### **REMOVE SOIL NAIL WALL (PORTION)**

Existing soil nail wall for earthwork support system, where shown on the plans to be removed when no longer required, shall be completely removed, except existing soil nails of the soil nail wall within the embankment limits may be left in place.

As-built plans of the existing soil nail wall for earthwork support system are available as information handout in "Supplemental Project Information," of these special provisions.

#### **MEASUREMENT AND PAYMENT**

Removing soil nail wall (portion) will be measured by the meter, measured along the soil nail wall before removal operations.

The contract price paid per meter for remove soil nail wall (portion) shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in removing soil nail wall (portion), complete in place, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

#### **REMOVE FALSEWORK TOWER**

Existing falsework material and falsework piling left in place within the area of improvement for the construction of embankment confinement system, and USCG parking lot, where shown on the plans to be removed, shall be removed and disposed of.

As-built plans for falsework tower as part of Temporary Bypass Structure, Bridge No. 34-0006 (Temp) as-builts are available in "Supplemental Information Handout," of these special provisions.

Existing falsework piling, consisting of HP 14x117 and HP 14x73 piling and tower steel bracing within the construction limit of embankment confinement system shall be removed to a depth of 5 meters below original ground or at the grade plane for embankment confinement system as shown on the plans.

Existing falsework HP 14x117 piling within the construction limit of parking lot shall be removed to a depth of not less than 0.9 meter below finished grade as shown on the plans.

All removed materials shall become the property of the Contractor and shall be disposed of in conformance with the provisions in Section 7-1.13, "Disposal of Material Outside the Highway Right of Way," of the Standard Specifications.

The contract lump sum price paid for remove falsework tower shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals and for doing all the work involved in removing falsework tower as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

## **RECONSTRUCT PEDESTRIAN TURNSTILE**

Reconstructing pedestrian turnstile with electronically controlled access shall consist of removing and reconstructing existing pedestrian turnstile at the new location as shown on the plans.

Reconstructing pedestrian turnstile shall be performed only by skilled personnel, capable to install and service the turnstile in compliance with the manufacturer's specifications. The Contractor shall not modify or alter the turnstile. The Contractor shall use only proper parts for the proper turnstile MST-3 Model.

The Contractor shall test the turnstile after the reconstruction of the pedestrian turnstile is complete, in compliance with the manufacturer's specifications to confirm the correct functionality of the MST-3 Model.

Each existing concrete foundation shall be removed to a depth of not less than 0.9 m below the adjacent finished grade. Existing concrete pad for pedestrian turnstile shall be completely removed. Removed concrete material shall be disposed of outside the highway right of way in conformance with the provisions in Section 7-1.13, "Disposal of Material Outside the Highway Right of Way," of the Standard Specifications.

New foundation work for reconstructed pedestrian turnstile shall conform to the provisions in "Concrete Structures," and "Reinforcement," of these special provisions.

The reinforced concrete foundations and concrete pad shall be constructed of concrete containing not less than 325 kg of cementitious material per cubic meter.

Welded wire fabric may be substituted for reinforcement bars and shall be required for concrete pad.

## **MEASUREMENT AND PAYMENT**

The contract unit price paid for reconstruct pedestrian turnstile shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals and for doing all the work involved in reconstructing pedestrian turnstile, complete in place, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

Full compensation for concrete pad shall be considered as included in the contract unit price paid for reconstruct pedestrian turnstile and no separate payment will be made therefor.

## **REMOVE HYDRANT**

Existing fire hydrants, at locations shown on the plans to be removed, shall be removed and salvaged.

The Contractor shall notify the Engineer and the San Francisco Public Utilities Commission/Water Department (SFWD) at (415)550-4949, at least 10 working days before any work is performed by SFWD forces for disconnecting and connecting of the water main, for the removal of the hydrant.

All components of the existing hydrant including riser, bury, gate valve with cover, restraining rings and bell bands shall be salvaged. Each component shall be cleaned and other foreign matter removed before being salvaged.

Trenches, holes, depressions and pits caused by the removal of the hydrant shall conform to the provisions in Section 15-1.02, "Preservation of Property," of the Standard Specifications.

Full compensation for salvaging fire hydrant including riser, bury, gate valve with cover, restraining rings and bell bands including cleaning and delivering fire hydrant and components to the SFWD shall be considered as included in the contract unit price paid for remove fire hydrant and no separate payment will be made therefore.

## **RELOCATE HYDRANT**

The work shall consist of relocating hydrant, including components and accessories such as 150 mm ductile iron pipe, service pipe, bell bend, riser, bury, restraining rings, and tie rod, as shown on the plans, and as specified in "Water Mains" of the special provisions, and these special provisions.

The San Francisco Public Utilities Commission/Water Department (SFWD) is the jurisdictional water utility district, regarding Navy water main. The SFWD will perform the installation of the relocation of hydrant which consists of lateral, bury, riser and hydrant, including the disconnection and connection of the water main, and disinfection.

The Contractor shall perform the excavating, trenching, backfilling and testing work.

Attention is directed to Section 7-1.14, "Cooperation," of the Standard Specifications and these special provisions.

The Contractor shall notify in writing the Engineer and the SFWD, at least 15 working days in advance of any work to be performed by SFWD forces. The Contractor shall confirm the scheduled work with the Engineer, and SFWD at (415) 550-4949, at least 3 working days before the actual field work by SFWD.

Hydrant bury shall be secured by installing lugs, restraining ring assembly, bell band and tie rod bolts as shown on the plans and/or directed by the Engineer. Concrete thrust block, of such size as the Engineer may direct, shall be 21 MPa strength and poured against undisturbed ground in the bottom and side of the trench. The backfill around the block shall be thoroughly tamped.



Hydrant shall be set exactly plumb and at the proper elevation on a block of reinforced concrete or as directed by the Engineer. Contractor shall backfill where underground installation is complete. Backfilling shall be in accordance with the applicable requirements of the Standard Specifications. In completing the backfill, hydrant shall be kept plumb and adequate support to prevent future movement shall be provided. Any hydrant which is out of plumb or not firmly supported shall be properly reset by the Contractor at his sole expense.

### **Testing**

The system shall be tested as a single unit, or in sections as approved by the Engineer. The Contractor shall furnish necessary materials, test pumps, instruments and labor and notify the Engineer at least 3 working days in advance of testing.

All piping shall be tested after assembly and prior to backfill, pipe wrapping, connecting fixtures, wrapping joints and covering the pipe. Systems shall show no loss in pressure or visible leaks.

The Contractor shall test water piping systems according to the following test schedule and in accordance with Section 20-5.03H, "Pressure Testing," of the Standard Specifications:

Test Schedule		
Piping System	Test Pressure	Test Media
Water	1550 kPa	Water

During testing of water systems, valves shall be closed and pipeline filled with water. Provisions shall be made for release of air.

After testing, the Contractor shall repair all leaks and retest to determine that leaks have been stopped. Surplus water shall be disposed of after testing as directed by the Engineer.

The contract unit price paid for relocate hydrant shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in relocating hydrant, complete in place, including cleaning and testing hydrant, excavation and backfill, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

### **10-1.54 WASH DOWN BUILDING**

This work includes washing down with water to clean the United States Coast Guard buildings in the vicinity of the bridge removal, in conformance with the provisions in Section 5-1.18, "Property and Facility Preservation," of the Standard Specifications and these special provisions.

Wash down with water to clean the United States Coast Guard buildings, when ordered by the Engineer, is to be paid for as extra work under Section 4-1.03D, "Extra Work," of the Standard Specifications.

### **10-1.55 REMOVE GUARD BOOTH AND CANOPY**

#### **GENERAL**

This work includes removing existing guard booth and canopy to gain access to or for new work, in accordance with the details shown on the plans and these special provisions.

As-built plans of the existing guard booth and reinforced concrete canopy facilities are available as Information Handout in "Supplemental Project Information," of these special provisions.

#### **Materials and Equipment**

Materials and equipment and materials inside the guard booth will belong to the Contractor once the Contractor starts the demolition, and shall not be sold on the Site.

#### **SUBMITTALS**

Submit a complete removal plan to the Engineer, detailing procedures, sequences, and all features required to perform the removal in a safe and controlled manner.

The removal plan must conform to "Working Drawings," of these special provisions, and includes:

1. The removal sequence, including staging of removal operations.
2. The temporary support shoring or temporary bracing.
3. The locations where work is to be performed over traffic or utilities.
4. The details, locations, and types of protective covers to be used.
5. The measures to assure that people, property, utilities, and improvements will not be endangered.

6. The details and measures for preventing material, equipment, and debris from falling onto public traffic, or the United States Coast Guard property

The removal plan must be submitted to the Engineer's approval before removal work is begun.

## **CONSTRUCTION**

Comply with the provisions in Sections 7-1.11, "Preservation of Property," 7-1.16, "Contractor's Responsibility for the Work and Materials," and 8-1.10, "Utility and Non-Highway Facilities," of the Standard Specifications, and "Sound Control Requirement," of these special provisions.

Coordinate with the United States Coast Guard to disconnect electrical system prior to begin the removal work.

Existing guard booth and reinforced concrete canopy must be completely removed including reinforced canopy structure, utilities, and concrete paved island at-grade and below grade. Foundations must be removed to a depth not less than one meter below finished grade.

Removed material generated shall be removed each day and disposed of in conformance with the provisions in Section 7-1.13, "Disposal of Material Outside the Highway Right of Way," of the Standard Specifications.

## **MEASUREMENT AND PAYMENT**

The contract lump sum price paid for remove guard booth and canopy shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in removing guard booth and canopy, complete in place, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

### **10-1.56 REMOVE BOOTH**

Existing painted wooden booth where shown on the plans to be removed, shall be removed in conformance with the provisions in Sections 5-1.18, "Property and Facility Preservation," 7-1.11, "Preservation of Property," and 7-1.16, "Contractor's Responsibility for the Work and Materials," of the Standard Specifications, and these special provisions.

The existing paint system on the wood booth contains lead. Work that disturbs lead-containing paint may (1) create a condition that is hazardous to human health and the environment, (2) produce toxic fumes when heated, and (3) produce waste material that contains metal in concentrations that equal or exceed the hazardous waste threshold limits established by Title 22 of the California Code of Regulations. Demolition debris shall be disposed of at a disposal facility that meets all the requirements specified by Federal, State, and Local Regulations.

The Contractor shall comply with the requirement of:

1. California Code of Regulations (CCR), Title 8, Chapter 4, Subchapter 4 – Construction Safety Orders.
2. California Health and Safety Code, Division 20, Chapter 6.5, "Hazardous Waste Control Act."
3. California Code of Regulations, Title 22, Division 4.5, (Environmental Health Standards for the Management of Hazardous Waste)

The Contractor shall submit a lead compliance program to the Engineer for approval before starting removal work on the project and at such times when revisions to the program are ordered by the Engineer. The compliance programs shall be prepared by an industrial hygienist certified by the American Council of Industrial Hygiene. The Engineer will notify the Contractor of the approval or rejection of any submitted or revised compliance program in not more than 10 days.

If measures being taken by the Contractor are inadequate to provide for worker safety and the containment and collection of residue from existing paint systems, the Engineer will direct the Contractor to revise his operations and the compliance program. Such directions will be in writing and will specify the items of work for which the Contractor's compliance programs are inadequate. No further work shall be performed on said items until the compliance programs are adequate and, if required, a revised compliance program has been approved.

The State will not be liable to the Contractor for failure to approve all or any portion of an originally submitted or revised compliance program for worker safety and the containment and collection of residue from existing paint systems, nor for any delays to the work due to the Contractor's failure to submit an acceptable compliance program.

## **PERMITS**

The Contractor shall obtain all special permits and licenses and give all notices required for performance and completion of the demolition and removal work, hauling, and disposal of debris.

Existing wooden booth features are:

1. Type of Building: Detached wooden structure (0.13-m x 0.16-m by 2.70-m in height) with two glass windows, and a wooden door with glass window on concrete foundations
2. Roof Covering: Flat, Asphalt Shingle
3. Total Building Area: 0.02 square meter
4. How Used: USCG Guard Booth
5. Contents: No content.
6. Building Site (Plot) Area: Approximately 1.5 square meters
7. Site Topographic Conditions: Level Lot
8. Utilities Present: No

#### **MEASUREMENT AND PAYMENT**

The contract lump sum price paid for remove booth includes full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in removing booth including required permits, complete in place, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

#### **10-1.57 SAMPLING AND REMOVAL OF ASBESTOS-CONTAINING MATERIAL**

##### **GENERAL**

###### **Summary**

This work includes inspection for asbestos-containing material (ACM), sample collection and analysis of suspected ACM, regulatory notification, removal of ACM, and disposal of ACM.

###### **Definitions**

**asbestos:** Includes chrysotile, amosite, crocidolite, tremolite, anthophyllite, actinolite, and any of these minerals that has been chemically treated and/or altered.

**asbestos-containing material (ACM):** Any building material, including asbestos cement pipe, that contains commercial asbestos in an amount greater than 1% by weight, area, or count.

**certified asbestos consultant:** An asbestos consultant certified by the Division of Occupational Safety and Health under 8 Code of Regs § 341.15 and 1529.

**certified industrial hygienist:** A person certified in the practice of industrial hygiene by the American Board of Industrial Hygiene

###### **Submittals**

**Asbestos Inspection Plan (Bridge Removal):** At least 60 days before starting bridge removal, submit an asbestos inspection plan that establishes the procedures to comply with requirements for asbestos inspection, including:

1. Sampling procedures
2. Analytical method for analyses
3. Sample handling and preservation

Sampling and analysis must comply with USEPA Asbestos/NESHAP Regulated Asbestos Containing Materials Guidance. The Engineer returns the plan within 15 days of the submittal for revision if needed. Revise the plan within 5 days and resubmit. The Engineer accepts the revised plan within 5 days if the revisions address any deficiencies. Do not start sampling and analysis work until the plan is accepted by the Engineer.

**Asbestos Sampling and Analysis Report:** Submit a report on the asbestos inspection within 10 days after completion of the inspection. The report must include:

1. Sampling protocols
2. Photographs of the structures and of the locations where samples were taken
3. Chain of custody
4. Laboratory data

Allow 5 days for the Engineer to review and accept the report. Make any changes requested for acceptance within 5 days. Submit 4 copies of the final report to the Engineer.

**Air Quality Management District Notification of Demolition:** Provide a copy of the required notification form and attachments to the Engineer before submittal to the Air Quality Management District.

**Asbestos Compliance Plan:** At least 15 days before starting work in areas that contain or are suspected to contain asbestos, submit an Asbestos Compliance Plan (ACP) that specifies work practices that will be followed to prevent or minimize exposure to asbestos. Attention is directed to Title 8, California Code of Regulations, Construction Safety Orders, Section 5192 (b) and Section 1529, "Asbestos", Occupational Safety and Health Guidance Manual published by the National Institute of Occupational Safety and Health (NIOSH) and the USEPA for elements of the ACP. The ACP must be signed by a certified industrial hygienist. The ACP must include:

1. Identification of key personnel for the project
2. Job hazard analysis for work assignments
3. Summary of risk assessment
4. Personal protective equipment
5. Delineation of work zones on-site
6. Decontamination procedures
7. General safe work practices
8. Security measures
9. Emergency response plans
10. Worker training

#### **Quality Control and Assurance**

**Qualifications:** The person in charge of asbestos inspection and abatement planning must be a certified asbestos consultant.

The person in charge of asbestos removal must be registered under Labor Code § 6501.5 and certified under Bus & Prof Code § 7058.6.

**Regulatory Notifications:** Notify the Bay Area Air Quality Management District (BAAQMD) under National Emission Standards for Asbestos, 40 CFR Pt 61, Subpart M, Health & Safety Code § 39658(b)(1), and the California Air Resources Board regulations - BAAQMD Reg 11. Rule 2. Submit the notification at least 10 business days before starting demolition. A demolition notification form may be obtained at:

<http://www.baaqmd.gov/Forms.aspx>

Deliver the original notification form with any necessary attachments to:

Bay Area Air Quality Management District  
939 Ellis Street  
San Francisco, CA 94109-7799

APCO - Jack Broadbent  
(415) 749-5052

Notify the APCO of changes to removal or demolition plans, including discovery of ACM during demolition or excavation, within 2 business days of the change.

Notify the Division of Occupational Safety and Health under 8 CA Code of Regs § 341.9.

**Training:** Before starting work in areas containing or suspected to contain asbestos, personnel who have no prior training or are not current in their training status, including State personnel, must complete a safety training program that meets the requirements of 8 CA Code of Regs § 1529. Provide a written certification of completion of safety training for trained personnel before starting work in areas containing or suspected to contain asbestos.

**Equipment and Medical Surveillance:** Provide personal protective equipment, training, and medical surveillance required by the Asbestos Compliance Plan to State personnel. The number of State personnel will be 3.

## **CONSTRUCTION**

### **Asbestos Inspection (Bridge Removal)**

Complete an inspection to determine if ACM or suspected ACM is present within the structure at least 30 days before starting bridge removal. Use a laboratory certified by the California Department of Public Health, Environmental Laboratory Accreditation Program for analysis of suspect ACM samples. Submit the name of the laboratory that will perform the asbestos analysis before beginning any sampling or analysis.

Collect a minimum of one sample per suspected ACM location. For pipes and other linear components of suspected ACM, collect one sample per 1.5 meter of exposed material. Sample all exposed suspected ACM on the structure. Sample suspected ACM encased in concrete when exposed during demolition. Analyze samples using analytical method 600/R-93-116 specified in 40 CFR Pt 763 Subpart F, Appendix A (Polarized Light Microscopy).

Transport samples under the chain of custody to the laboratory within 24 hours of sampling. The laboratory must test the samples within 48 hours. Submit laboratory results as soon as they are available.

### **Suspected ACM Discovered during Demolition or Excavation**

If suspected ACM is discovered during demolition or excavation, the portion of the work that involves the suspected ACM must be performed by or under the supervision of licensed and certified personnel. Test the suspected ACM in compliance with the Asbestos Inspection Plan (Bridge Removal) before disposal.

### **Removal**

Comply with CA 8 Code of Regs and BAAQMD Reg 11, Rule 2. Remove friable ACM using the wetting method. Remove non-friable ACM using a method that prevents breakage. ACM encased in concrete or other similar structural material does not have to be removed before demolition, but must be adequately wetted whenever exposed during demolition. Prevent visible emissions from all ACM removal activities.

Asbestos removal procedures include:

1. Installing asbestos warning signs at perimeters of abatement work areas.
2. Wetting asbestos materials with sprayers.
3. Containing large volumes of asbestos materials in disposal bins for temporary storage until removed from the site.
4. Providing manifests for waste disposal upon completion for the Engineer to sign.
5. Providing transporters registered to transport hazardous waste in the State of California under Health and Safety Code Ch 6.5, Div 20 and 22 Code of Regs, Div 4.5.
6. Disposing of asbestos materials at a permitted disposal facility.
7. Working in accordance with federal, state, and local requirements for asbestos work.

Mark all regulated work areas with the following or equivalent warning:

**DANGER**  
**ASBESTOS**  
**CANCER AND LUNG DISEASE HAZARD**  
**AUTHORIZED PERSONNEL ONLY**

### **Packaging**

Comply with 22 CA Code of Regs, Division 4.5, Chapter 12, Article 3 requirements for packaging and labeling removed ACM. Place removed ACM in approved plastic containers (double ply, 0.15-mm minimum thickness, plastic bags) with caution labels affixed to bags. Caution labels must have conspicuous, legible lettering, that spells out the following or equivalent warning:

**DANGER**  
**CONTAINS ASBESTOS FIBERS**  
**AVOID CREATING DUST**  
**CANCER AND LUNG DISEASE HAZARD**

The removed materials containing asbestos may be placed directly into a covered roll off or drop box that has the same caution label affixed on all sides.

### **Transportation**

All haulers of friable ACM must have current registration with the State Department of Toxic Substances Control (DTSC) for transporting hazardous waste and have a U.S. Environmental Protection Agency Identification Number (U.S. EPA I.D. Number). All vehicles used to transport hazardous waste material must carry a valid registration during transport.

### **Disposal**

The Engineer obtains the required U.S. EPA generator identification numbers and signs the hazardous waste manifests for disposal of ACM. Request a generator identification number from the Engineer at least 5 days before the first shipment. Dispose of friable and non-friable waste containing asbestos at a disposal facility permitted to accept the waste and that meets all the requirements specified by federal, state, and local regulations. Notify the proper authorities at the disposal site in advance of delivery of ACM. Conduct additional sampling deemed necessary by the owner of the disposal facility for acceptance of the material. Provide a copy of all waste shipment records to the Engineer within 35 days after shipment.

## **MEASUREMENT AND PAYMENT**

The contract lump sum price paid for asbestos compliance plan includes full compensation for furnishing all labor, materials, tools, equipment, and incidentals and for doing all the work involved in preparing an Asbestos Compliance Plan, including review by a certified industrial hygienist, and for providing personal protective equipment, training and medical surveillance, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

The contract lump sum price paid for asbestos inspection (bridge removal) includes full compensation for furnishing all labor, material, tools, equipment, and incidentals and for doing all the work involved in performing the asbestos inspection, complete in place, including planning, sample collection, analysis, and report preparation as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

Removal, transportation, and disposal of ACM that is discovered during the asbestos inspection, demolition, or excavation will be paid for as extra work as specified in Section 4 1.03D, "Extra Work," of the Standard Specifications.

### **10-1.58 BRIDGE REMOVAL, PORTION (CANTILEVER TRUSS)**

Removing bridges or portions of bridges shall conform to the provisions in Section 15-4, "Bridge Removal," of the Standard Specifications and these special provisions.

The Contractor is directed to the requirements in "Construction Site Management," of these special provisions during the bridge removal.

Attention is directed to "Relations to United States Coast Guard," of these special provisions.

Attention is directed to "Permits, Licenses, Agreements, and Certifications," "Species Protection," and "Bird Protection," of these special provisions.

Attention is directed to "Temporary Supports" and "Falsework" of these special provisions.

#### **BRIDGE REMOVAL (PORTION) LOCATION G CANTILEVER TRUSS DEMOLITION (Bridge No. 33-0025)**

Remove existing cantilever truss bridge portion of the East Bay Bridge, Br. No. 33-0025 as shown on the plans.

Removed materials that are not to be salvaged or used in the reconstruction shall become the property of the Contractor and shall be disposed of in conformance with the provisions in Section 7-1.13, "Disposal of Material Outside the Highway Right of Way," of the Standard Specifications.

Welding to existing bridge members will not be permitted. Only high strength bolted connections to existing bridge members will be allowed.

The use of existing fenders for temporary support of the existing bridge, equipment or materials loading will not be permitted.

Expansive cracking agents may be used for concrete removal, as approved by the Engineer.

The Contractor shall submit a complete bridge removal plan to the Engineer for review and comment. The bridge removal plan shall detail the procedures, sequences, and all features required to perform the removal in a safe and controlled manner.

The bridge removal plan shall conform to the following minimum requirements:

1. Removal sequence shall conform to the removal sequence shown on the plansheet titled "Existing Cantilever Truss Demolition, Index To Plans".
2. Temporary supports will not be allowed in the water between Pier E2 and Pier E3.
3. Temporary supports shall be used between Pier E1 and E2 and between Pier E3 and E4.
4. The drawings shall clearly show a longitudinal connection that transfers the longitudinal load of the partially demolished structure to the adjacent superstructure at Pier E4. The assumed longitudinal load to be used, shall be the sum of the actual horizontal loads due to equipment, construction sequence or other causes, and the wind loads shown on the plans, but in no case shall the assumed longitudinal load to be resisted be less than 5 percent of the total dead load of the structure to be removed.
5. The drawings shall clearly illustrate the vertical, lateral and longitudinal structural load paths at each stage of demolition.

The bridge removal plan shall include, but not be limited to the following:

1. Complete 3-D structural computer analysis and evaluation of the bridge for the removal procedure to be used.
2. Report with a summary of input and output files, including, but not limited to, a table showing demand/capacity ratios for all stages of bridge removal and all associated calculations.
3. The removal sequence, including staging of removal operations.
4. Methods and details for member or connection strengthening.
5. Methods and details for supporting or stiffening requirements.
6. Equipment locations on the structure during removal operations.
7. Temporary supports including lifting apparatus, temporary support shoring or temporary bracing.
8. Details of construction area enclosure.
9. Locations where work is to be performed over waterway.
10. Details, locations, and types of containment systems to be used.
11. Measures to assure that people, property, and utilities will not be endangered.
12. Details and measures for preventing material, equipment, and debris from falling on the ground or in the waterway.
13. Methods and description of shipment plan for removed bridge.
14. Methods of hazardous paint removal to ensure that the allowable threshold limits for air quality are not exceeded.
15. Independent check calculations
16. Certifications by the Contractor's engineer and the check engineer.

The bridge removal plan shall be prepared, signed and stamped by an engineer who is registered as a Civil Engineer in California. The engineer shall have at least 10 years experience as a registered Civil Engineer, shall have been in responsible charge for at least three bridge demolition projects and shall have prepared demolition plans for at least one large, continuous steel truss bridge.

The bridge removal plan shall conform to the provisions in "Working Drawings," of these special provisions except the Engineer's approval will not be required. The removal plan shall be independently checked, stamped and signed by another registered Civil Engineer with at least the same experience and qualifications. The independent check shall include all analysis and calculations necessary to independently check all aspects of the removal plan. The check engineer shall not be an employee of the Contractor and shall not be employed by the same firm as the design engineer.

The Contractor's engineer and the check engineer shall provide certification that the removal plan complies with all contract requirements and is adequate for the purpose intended. The Contractor shall allow 60 days for the Engineer's review and comment. The design calculations and details shall be adequate to demonstrate the stability of the structure during all stages of the removal operations. Calculations shall be provided for each stage of bridge removal and shall include dead and live loads and the wind load values shown on the plans. At a minimum, a stage will be considered to be removal of the deck, the deck framing, or any truss members, in any span; or pier framing, or steel towers at support locations. Member stresses shall not exceed operating allowable stress limits during application of temporary construction loads and during all phases of demolition.

Temporary support shoring, temporary bracing, and containment systems, as required, shall be designed and constructed in conformance with the provisions in Section 51-1.06, "Falsework," of the Standard Specifications and these special provisions.

The assumed horizontal load to be resisted by the temporary support shoring and temporary bracing, for removal operations only, shall be the sum of the actual horizontal loads due to equipment, construction sequence or other causes, and the wind loads shown on the plans, but in no case shall the assumed horizontal load to be resisted in any direction be less than 5 percent of the total dead load of the structure to be removed.

The following additional requirements apply to the removal of bridges whenever the removal work is to be performed over a waterway:

1. A containment system shall be constructed before beginning bridge removal work. The containment system shall be supported by shoring, falsework, or members of the existing structure. The Contractor shall be responsible for designing and constructing safe and adequate containment systems, shoring, and falsework with sufficient strength and rigidity to support the entire load to be imposed.
2. Bridge removal methods shall be described in the working drawings, supported by calculations with sufficient details to substantiate live loads used in the containment system design. Dead and live load values assumed for designing the containment system shall be shown on the working drawings.
3. The containment system shall prevent any materials, equipment, or debris from falling onto the waterway. The containment system shall have a minimum strength equivalent to that provided by good, sound Douglas fir planking having a nominal thickness of 50 mm. Additional layers of material shall be furnished as necessary to prevent fine materials or debris from sifting down upon the waterway. The bottom of the containment system shall be made of a non-flammable material that will prevent burning metal debris from falling into the waterway. The sides of the containment system shall extend vertically from the bottom of the containment system along the sides of the bridge a sufficient height above the point of removal to contain all debris. The containment system shall extend longitudinally beyond the point of removal a sufficient length to contain all debris but not less than 100 feet. The seams or joints of the containment system shall be sealed or double layered to prevent fine material from sifting through the cracks and falling in the waterway.
4. During the removal of bridge deck segments, the lower deck maybe used for the bottom of the containment system provided it complies with the requirements for the containment system as specified herein..
5. The containment system shall extend beyond the outside face of the truss as necessary to accommodate bridge removal and containment of all debris.
6. The construction of the containment system as specified herein shall not relieve the Contractor of responsibilities specified in Section 7-1.12A, "Indemnification," and Section 7-1.12B, "Insurance," of the Standard Specifications.
7. Before removal of the containment system, the Contractor shall clean the containment system of all debris and fine material to ensure that no material falls into the waterway.

The Contractor's registered engineer shall be present at all times when bridge removal operations are in progress. The Contractor's registered engineer shall inspect the bridge removal operation and report in writing on a daily basis the progress of the operation and the status of the remaining structure. A copy of the daily report shall be available at the site of the work at the end of each shift and at all times. Should an unplanned event occur or the bridge operation deviate from the bridge removal plan, the Contractor's registered engineer shall submit immediately to the Engineer for approval, the procedure of operation proposed to correct or remedy the occurrence.

Full compensation for member or connection strengthening, supporting or stiffening requirements, and temporary bracing shall be considered as included in the contract lump sum price paid for bridge removal (portion), location G and no additional compensation will be allowed therefor.

#### **10-1.59 JACK BRIDGE**

Jack bridge shall consist of jacking bridge superstructure at the YBI edge beam support structure in conformance with the details shown on the plans and these special provisions.

The Contractor shall design, furnish, operate, monitor and remove the jacking and support system with appurtenant items as necessary to jack and shim the structure in a controlled manner.

The construction sequence and application of jacking loads shall be as shown on the plans. Proposed changes to the construction sequence and application of jacking loads shall be subject to the Engineer's approval.

Attention is directed to "Maintaining Traffic" and "Falsework" of these special provisions.

The Contractor shall provide a designated field engineer who is registered as a Civil Engineer in the State California. The Contractor's designated field engineer shall be present at the jobsite throughout the jacking operations.



### **Load Monitoring**

The Contractor shall provide load cells at each jack capable of continuously reporting accurate loadings for the duration the jack is in operation. The load cells shall be approved by the Engineer.

### **WORKING DRAWINGS**

The Contractor shall submit to the Engineer working drawings and design calculations for jacking bridge in conforming to "Working Drawings," of these special provisions.

In addition to the requirements in Section 51-1.06A, "Falsework Design and Drawings," of the Standard Specifications, bridge jacking working drawings shall include the following:

1. Complete description and details of methods, equipment and sequence for jacking the structure in a safe and controlled manner.
2. Complete details of methods, equipment and sequence of operations to achieve final lines and grades relative to the existing structure as shown on the plans
3. Description, location, and value of all loads including construction equipment loads
4. Details for:
  - 4.1. Jacking system with appurtenant items
  - 4.2. Vertical displacement monitoring system
  - 4.3. Jacking load monitoring plan

After complete working drawings and all supporting data are submitted, the Contractor shall allow 3 weeks for the Engineer's review of each submittal.

### **CONSTRUCTION**

The Contractor's registered engineer shall be present at the bridge site at all times when jacking operations or adjustments are in progress. Should an unplanned event occur, the Contractor's registered engineer shall submit immediately to the Engineer for approval, the procedure or proposed operation to correct or remedy the occurrence.

The Contractor shall perform an initial survey as part of the displacement monitoring system to record the location of the existing structure prior to commencement of any work. Two copies of the survey shall be signed by an engineer who is registered as a Civil Engineer in the State of California, and submitted to the Engineer.

Vandal-resistant displacement monitoring equipment shall be provided and maintained. Vertical displacements of the existing structure shall be monitored continuously during jacking operations and shall be accurately measured and recorded daily during reconstruction work. As a minimum, elevations shall be taken prior to the start of jacking operations, immediately after jacking is complete, after successful load transfer is attained and 30 days after successful load transfer, as shown on the plans. As a minimum, the existing structure shall be monitored at each support and at mid span. Control points at each location shall be located at the edge of the superstructure. The records of vertical displacement shall be signed by an engineer who is registered as a Civil Engineer in the State of California and available to the Engineer at the jobsite during normal working hours, and a copy of the record shall be delivered to the Engineer at the completion of the work.

### **Manufactured Assemblies**

Manufactured assemblies shall conform to the provisions in Section 51-1.06A(2), "Design Stresses, Loadings, and Deflections," of the Standard Specifications and these special provisions.

Each jack shall be equipped with a pressure gage and a load cell for determining the jacking force. Pressure gages shall have an accuracy reading dial at least 150 mm in diameter. Each jack shall be calibrated by a private laboratory approved by the Transportation Laboratory within 6 months prior to use and after each repair. Each jack and its gage shall be calibrated as a unit with the cylinder extension in the approximate position that it will be at final jacking force and shall be accompanied by a certified calibration chart. Load cells shall be calibrated and provided with an indicator by which the jacking force is determined.

### **JACKING OPERATIONS**

Jacking operations shall be carefully controlled and monitored to ensure that the jacking loads are applied simultaneously to prevent distortion and excessive stresses that would damage the structure.

A redundant system of supports shall be provided during the entire jacking operations for backup should any of the jacks fail. The redundant system shall include stacks of steel plates added as necessary to maintain the redundant supports at each jack location within 6 mm of the jacking sill or corbels.

Adequate means shall be employed to prevent unplanned lateral and longitudinal movement of the superstructure. The jacking and support system and the superstructure shall be stable during all phases of the operation.

Should unanticipated displacements, cracking or other damage occur, construction shall be discontinued until corrective measures satisfactory to the Engineer are performed. Damage to the structure as a result of the Contractor's operations shall be repaired by the Contractor in conformance with the provisions in Section 7-1.11, "Preservation of Property," of the Standard Specifications.

Jacking assemblies shall remain in place as necessary to support the structure until successful load transfer has been attained as shown on the plans.

When no longer needed, attachments shall be removed from the structure and concrete surfaces restored to original conditions, except where permanent alterations are shown on the plans.

Except for jacks to be left in place, when jacking assemblies are no longer needed, they shall become the property of the Contractor and shall be disposed of in conformance with the provisions in Section 7-1.13, "Disposal of Material Outside the Highway Right of Way," of the Standard Specifications.

## **PAYMENT**

The contract lump sum price paid for jack bridge shall include full compensation for furnishing all labor, materials, tools, equipment and incidentals, and for doing all the work involved in designing, constructing, maintaining, and removing the bridge jacking system (except for jacks to be left in place), including monitoring jacking loads, and monitoring displacements, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

### **10-1.60 REMOVE YELLOW TRAFFIC STRIPE AND PAVEMENT MARKING (HAZARDOUS WASTE)**

#### **GENERAL**

##### **Summary**

This work includes removing existing yellow thermoplastic and yellow painted traffic stripe and pavement marking at the locations shown on the plans. The residue from the removal of this material is a hazardous waste.

Residue from removal of yellow thermoplastic and yellow painted traffic stripe and pavement marking contains lead chromate. The average lead concentration is greater than or equal to 1000 mg/kg total lead or 5 mg/l soluble lead. When applied to the roadway, the yellow thermoplastic and yellow painted traffic stripe and pavement marking contained as much as 2.6 percent lead. Residue produced from the removal of this yellow thermoplastic and yellow painted traffic stripe and pavement marking contains heavy metals in concentrations that exceed thresholds established by the Health and Safety Code and 22 CA Code of Regs. For bidding purposes, assume that the residue is not regulated under the Federal Resource Conservation and Recovery Act (RCRA), 42 USC § 6901 et seq.. Yellow thermoplastic and yellow paint may produce toxic fumes when heated.

##### **Submittals**

**Lead Compliance Plan:** Prepare and submit a lead compliance plan to prevent or minimize worker exposure to lead while managing and handling traffic stripe residue, and pavement marking residue containing lead. Regulations containing specific Cal/OSHA requirements when working with lead include 8 CA Code of Regs § 1532.1.

The plan must contain the items listed in 8 CA Code of Regs § 1532.1(e)(2)(B). Before submittal, a CIH must sign and seal the plan. Submit the plan at least 7 days before starting any activity that presents the potential for lead exposure. The Engineer notifies you of the acceptability of the plan within 4 business days of receipt.

Before starting any activity that presents the potential for lead exposure to employees who have no prior training, including State employees, provide a safety training program to these employees that complies with 8 CA Code of Regs § 1532.1 and your lead compliance program.

Submit copies of air monitoring or job site inspection reports made by or under the direction of the CIH under 8 CA Code of Regs § 1532.1 within 10 days after the date of monitoring or inspection.

Supply personal protective equipment, training, and washing facilities required by your lead compliance plan for ten (10) State employees.

**Work Plan:** Submit a work plan for the removal, containment, storage, and disposal of yellow thermoplastic and yellow painted traffic stripe and pavement marking for acceptance not less than 15 days prior to the start of the removal operations. The work plan must include:

1. Objective of the operation
2. Removal equipment

3. Type of hazardous waste storage containers
4. Container storage location and how it will be secured
5. Hazardous waste sampling protocol and QA/QC requirements and procedures
6. Qualifications of sampling personnel
7. Analytical lab that will perform the analyses
8. Certification documentation of the hazardous waste hauler that will transport the hazardous waste
9. Disposal site that will accept the hazardous waste residue

The Engineer will review the work plan within 5 business days of receipt.

Do not perform work that generates hazardous waste residue until the work plan has been accepted by the Engineer. The Engineer's review and acceptance does not waive any contract requirements and does not relieve the Contractor from complying with Federal, State, and local laws, regulations, and requirements.

Correct any rejected work plan and resubmit a corrected work plan within 5 business days of notification by the Engineer; at which time a new review period of 5 business days will begin.

**Analytical Test Results:** Submit analytical test results of the residue from removal of yellow thermoplastic and yellow painted traffic stripe and pavement marking, including chain of custody documentation, for review and acceptance before:

1. Requesting the Engineer's signature on the waste profile requested by the disposal facility
2. Requesting the Engineer obtain an EPA ID no. for disposal
3. Removing the residue from the site

**United States Environmental Protection Agency Identification Number Request:** Submit a request for the U.S. EPA ID no. when the Engineer accepts analytical test results documenting that residue from removal of yellow thermoplastic and yellow painted traffic stripe and pavement marking is a hazardous waste.

**Disposal Documentation:** Submit receiving landfill documentation of proper disposal within 5 business days of residue transport from the project.

## CONSTRUCTION

Where grinding or other approved methods are used to remove yellow thermoplastic and yellow painted traffic stripe and pavement marking that will produce a hazardous waste residue, the removed residue, including dust, must be contained and collected immediately. Use a HEPA filter-equipped vacuum attachment operated concurrently with the removal operations or other equally effective approved methods for collection of the residue.

Store hazardous waste residue in labeled and covered containers. Labels must comply with the provisions of 22 CA Code of Regs §§66262.31 and 66262.32. Mark labels with:

1. Date the hazardous waste is generated
2. The words "Hazardous Waste"
3. Composition and physical state of the hazardous waste (for example, asphalt grindings with thermoplastic or paint)
4. The word "Toxic"
5. Name, address, and telephone no. of the Engineer
6. Contract no.
7. Contractor or subcontractor name

Use metal containers approved by the U.S. Department of Transportation for the transportation and temporary storage of the removed residue. Handle the containers such that no spillage occurs. Store containers in a secured enclosure. Acceptable secure enclosures include a locked chain link fenced area or a lockable shipping container located within the project limits until disposal as approved.

Make necessary arrangements to test the yellow thermoplastic and yellow paint hazardous waste residue as required by the disposal facility and these special provisions. Testing must include, at a minimum:

1. Total lead by EPA Method 6010C
2. Total chromium by US EPA Method 7000 series
3. Soluble lead by California Waste Extraction Test
4. Soluble chromium by California Waste Extraction Test
5. Soluble lead by Toxicity Characteristic Leaching Procedure

## 6. Soluble chromium by Toxicity Characteristic Leaching Procedure

From the 1st 840 L of hazardous waste or portion thereof if less than 840 L of hazardous waste are produced, a minimum of 4 randomly selected samples must be taken and analyzed individually. Samples must not be composited. From each additional 3360 L of hazardous waste or portion thereof if less than 3360 L are produced, a minimum of 1 additional random sample must be taken and analyzed. Use chain of custody procedures consistent with Chapter 9 of U.S. EPA Test Methods for Evaluating Solid Waste, Physical/Chemical Methods (SW-846) while transporting samples from the project to the laboratory. Each sample must be homogenized before analysis by the laboratory performing the analyses. A sample aliquot sufficient to cover the amount necessary for the total and the soluble analyses must then be taken. This aliquot must be homogenized a 2nd time and the total and soluble analyses run on this aliquot. The homogenization process must not include grinding of the samples. Submit the name and location of the disposal facility that will be accepting the hazardous waste and the analytical laboratory along with the testing requirements not less than 5 business days before the start of removal of yellow thermoplastic and yellow painted traffic stripe and pavement marking. The analytical laboratory must be certified by the CA Department of Public Health Environmental Laboratory Accreditation Program for all analyses to be performed.

After the Engineer accepts the analytical test results, dispose of yellow thermoplastic and yellow paint hazardous waste residue at a Class 1 disposal facility located in CA under the requirements of the disposal facility operator within 90 days after accumulating 100 kg of residue and dust.

If less than 100 kg of hazardous waste residue and dust is generated in total, it must be disposed of within 90 days after the start of accumulation of the residue and dust.

Use a hazardous waste manifest and a transporter registered with the CA Department of Toxic Substance Control. The Engineer will obtain the U.S. EPA ID no. and will sign all manifests as the generator within 2 business days of receiving and accepting the analytical test results and receiving your request for the U.S. EPA ID no.

If analytical test results demonstrate that the residue is a non-hazardous waste and the Engineer agrees, dispose of the residue at an appropriately permitted Class II or Class III facility under Section 7-1.13, "Disposal of Material Outside the Highway Right of Way," of the Standard Specifications.

## MEASUREMENT AND PAYMENT

The contract price paid per meter for remove yellow thermoplastic traffic stripe (hazardous waste) and remove yellow painted traffic stripe or per square meter for remove yellow thermoplastic pavement marking and remove yellow painted pavement marking includes full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all of the work involved in removal, containment, storage, and disposal, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

The contract lump sum price paid for lead compliance plan includes full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in preparing and implementing the plan as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

Full compensation for (1) work plan for the removal, containment, storage, and disposal of yellow thermoplastic and yellow painted traffic stripe and pavement marking hazardous waste residue, (2) analytical test results, (3) US EPA ID no. request, and (4) receiving landfill documentation of proper disposal are included in the contract prices paid per linear meter for remove yellow thermoplastic traffic stripe and remove yellow painted traffic stripe or per square meter for remove yellow thermoplastic pavement marking and remove yellow painted pavement marking and no separate payment will be made therefor.

If analytical test results demonstrate that the residue is a non-hazardous waste and the Engineer agrees to disposal at a non-hazardous waste disposal facility, no cost adjustment will be made.

## 10-1.61 TREATED WOOD WASTE

### GENERAL

#### Summary

This work includes handling, storing, transporting, and disposing of treated wood waste (TWW).

Wood removed from roadside signs, metal beam guard railing and soldier pile wall lagging is treated with one or more of the following:

1. Creosote
2. Pentachlorophenol
3. Copper azole
4. Copper boron azole
5. Chromated copper arsenate
6. Ammoniacal copper zinc arsenate

7. Copper naphthenate
8. Alkaline copper quaternary

Manage TWW under Title 22 CA Code of Regulations, Division 4.5, Chapter 34.

#### **Submittals**

For disposal of TWW submit a copy of each completed shipping record and weight receipt to the Engineer within 5 business days of disposal.

#### **CONSTRUCTION**

Provide training to personnel who handle TWW or may come in contact with TWW that includes:

1. All applicable requirements of Title 8 CA Code of Regulations
2. Procedures for identifying and segregating TWW
3. Safe handling practices
4. Requirements of Title 22 CA Code of Regulations, Division 4.5, Chapter 34
5. Proper disposal methods

Store TWW before disposal using any of the following methods:

1. Elevate on blocks above a reasonably foreseeable run-on elevation and protect from precipitation
2. Place in water-resistant containers designed for shipping or solid waste collection
3. Place on a containment surface or pad protected from run-on and precipitation
4. Place in a storage building as defined in Title 22 CA Code of Regulations, Div. 4.5, Chp. 34, Section 67386.6 (a)(2)(c)

Prevent unauthorized access to TWW using a secured enclosure such as a locked chain link fenced area or a lockable shipping container located within the project limits.

Resize and segregate TWW at a location where debris from the operation including sawdust and chips can be contained. Collect and manage the debris as TWW.

Provide water-resistant labels, that comply with Title 22 CA Code of Regulations, Division 4.5, Chapter 34, to clearly mark and identify TWW and accumulation areas. Labels must include:

1. Caltrans, District number, Construction, contract number
2. District office address
3. Engineer's name, address, and telephone number
4. Contractor's contact name and telephone number
5. Date placed in storage

Before transporting TWW, obtain an agreement from the receiving facility that the treated wood waste will be accepted. Protect shipments of treated wood waste from loss and exposure to precipitation. For projects with 4,536 kg or more of TWW, request a hazardous waste generator identification number from the Engineer at least 5 business days before the first shipment. Each shipment must be accompanied by a shipping record such as a bill of lading or invoice that includes:

1. Caltrans with district number
2. Construction contract number
3. District office address
4. Engineer's name, address, and telephone number
5. Contractor's contact name and telephone number
6. Receiving facility name and address
7. Waste description: treated wood waste (preservative type if known or unknown/mixture)
8. Project location
9. Estimated quantity of shipment by weight or volume
10. Date of transport
11. Date of receipt by the receiving TWW facility
12. Weight of shipment as measured by the receiving TWW facility
13. For projects with 4,536 kg or more of TWW include the generator identification number

The shipping record must be at least a 4-part carbon or carbonless 216 mm x 279 mm form to allow retention of copies by the Engineer, transporter, and disposal facility.

Dispose of TWW at an approved TWW facility. A list of currently approved TWW facilities may be viewed at:

[http://www.dtsc.ca.gov/HazardousWaste/upload/TWW\\_Confirmed\\_Landfill\\_List.pdf](http://www.dtsc.ca.gov/HazardousWaste/upload/TWW_Confirmed_Landfill_List.pdf)

Dispose of TWW within:

1. 90 days of generation if stored on blocks
2. 180 days of generation if stored on a containment surface or pad.
3. One year of generation if filling a water-resistant container, or 90 days after the container is full, whichever is shorter
4. One year of generation if storing in a storage building as defined in Title 22 CA code of Regulations, Div. 4.5, Chp. 34, Section 67386.6(a)(2)(C)

### **MEASUREMENT AND PAYMENT**

Full compensation for handling, storing, transporting, and disposing TWW, including personnel training, is included in the contract price paid for the various items of work involved and no additional compensation will be allowed therefor.

### **10-1.62 VIBRATION MONITORING**

This work shall consist of furnishing, installing and maintaining vibration-monitoring instrumentation; collecting vibration data; and interpreting and reporting the results of vibration monitoring as specified herein. This work shall include the implementation by the Contractor of any required remedial and precautionary measures, using the vibration monitoring data, to protect the following facilities from excess vibration during construction activities:

1. Building No. 262 (Torpedo Factory), Historic Architectural Resource, (ESA 2a)
2. United States Navy – The Senior Officers' Quarters Historic District (Quarters 1 through 7), Historic Architectural Resource, and grounds (ESA 2b)
3. Quarters 8, and grounds, (ESA 2c)
4. United States Coast Guard Base – Quarters 9, B, C, 10, 24, 25, 26, 27, and 267 (garage)
5. Concrete Retaining Walls and Weir, Historic Architectural Resource, (ESA 9a, and 9b)

### **GENERAL**

The Contractor shall be responsible for the following, including but not limited to:

1. Furnish and install vibration-monitoring instrumentation.
2. Protect from damage and maintain instruments installed by the Contractor and repair or replace damaged or inoperative instruments.
3. Collect, interpret and report data from instrumentation specified herein.
4. Implement response actions.

The Department is not responsible for the safety of the work based on vibration-monitoring data, and compliance with this Section does not relieve the Contractor of full responsibility for damage caused by the Contractor's operations.

### **VIBRATION MONITORING PERSONNEL**

The Contractor's vibration-monitoring personnel shall have the qualifications specified herein. Vibration monitoring may be on the staff of the Contractor. However, they shall not be employed nor compensated by subcontractors, or by persons or entities hired by subcontractors, who will provide other services or material for the project.

The Contractor's vibration-monitoring personnel shall include a Vibration Instrumentation Engineer who meets one of the following minimum qualifications:

1. Registered Geophysicist or Professional Engineer in the State of California with at least 5 years of experience in the installation and use of vibration-monitoring instrumentation and data interpretation.

2. Graduate level degree from an accredited University in Physics or Acoustics with at least 5 years experience in the installation and use of vibration-monitoring instrumentation and data interpretation.

The Vibration Instrumentation Engineer shall:

1. Be on site and supervise the initial installation of each vibration-monitoring instrument.
2. Supervise interpretations of vibration-monitoring data.

The Contractor's vibration-monitoring personnel shall be subject to the Engineer's approval.

### **SUBMITTALS**

Prior to any significant impact work and prior to performing any vibration monitoring, the Contractor shall submit to the Engineer a written vibration monitoring plan, vibration monitoring equipment manufacturer's product data and the resumes of the Vibration Instrumentation Engineer and any vibration monitoring technical support personnel.

The vibration monitoring equipment manufacturer's data shall describe in detail all vibration-monitoring instruments. Requests for consideration of substitutions, if any, together with product data and instruction manuals for requested substitutions.

The resumes of the Vibration Instrumentation Engineer and any vibration monitoring technical support personnel shall be sufficient to define details of relevant experience.

The written vibration monitoring plan shall detail the procedures for vibration monitoring. Such details shall include, but not limited to:

1. The name of the Firm providing the vibration monitoring services.
2. Description of the instrumentation and equipment to be used.
3. Measurement locations and methods for mounting the vibration sensors.
4. Procedures for data collection and analysis.
5. Means and methods of providing warning when the particle velocity equals or exceeds specified limits.
6. Generalized plans of action to be implemented in the event the particle velocity equals or exceeds specified limits. The generalized plans of action shall be positive measures by the Contractor to control vibrations (e.g. using alternative construction methods).
7. Name of the "responsible person" designated by the Contractor. The responsible person designated by the Contractor shall have the authority to stop the work causing the vibration.

Within 5 days of receipt of each instrument at the site, the Contractor shall submit to the Engineer a copy of the instruction manual and the laboratory calibration and test equipment certification.

In addition, the Contractor shall submit data and reports as specified in "Data Reduction, Processing, Plotting and Reporting" in these special Provisions.

The review period shall be the same as those set forth in Section 51-1.06A, "Falsework Design and Drawings," of the Standard Specifications.

### **VIBRATION MONITORING EQUIPMENT**

The Contractor shall provide portable seismographs for monitoring the velocities of ground vibrations resulting from construction activities. Seismographs shall be Model DS-477 Blastmate II as manufactured by InstanTel Inc., Kanata (Ottawa), Ontario, Canada, Model VMS-500 as manufactured by Thomas Instruments, Inc., Spofford, NH, or Model NC5310/D, as manufactured by Nomis Inc., Birmingham, AL, or acceptable equivalent. The seismograph shall have the following minimum features:

1. Seismic range: 0.25 to 102-mm per second with an accuracy of +5 percent of the measured peak particle velocity or better at frequencies between 10 Hertz and 100 Hertz, and with a resolution of 0.25-mm per second or less.
2. Frequency response (+3 dB points): 2 to 200 Hertz.
3. Three channels for simultaneous time-domain monitoring of vibration velocities in digital format on three perpendicular axes.
4. Two power sources: internal rechargeable battery and charger and 115 volts AC. Battery must be capable of supplying power to monitor vibrations continuously for up to 24 hours.
5. Capable of internal, dynamic calibration.

6. Direct writing to printer and capability to transfer data from memory to external device. Instruments must be capable of producing strip chart recordings of readings on site within one hour of obtaining the readings. Provide computer software to perform analysis and produce reports of continuous monitoring.
7. Continuous monitoring mode must be capable of recording single-component peak particle velocities, and frequency of peaks with an interval of one minute or less.
8. One seismograph must be water-proof and capable of downhole stationing.

Whenever any product is specified by brand name and model number, such specifications shall be deemed to be used for the purpose of establishing a standard of quality and facilitating the description of the product desired. The term "acceptable equivalent" shall be understood to indicate a product that is the same or better than the product named in the specifications in function, quality, performance, reliability, and general configuration. This procedure is not to be construed as eliminating other manufacturers' suitable products of equal quality.

The Contractor may request to substitute an "acceptable equivalent" vibration monitoring equipment and shall submit complete comparative data to the Engineer for consideration of another product. Any request from the Contractor for consideration of a substitution shall clearly state the nature of the deviation from the product specified. Substitute products shall not be used in the work unless accepted by the Engineer in writing. The Engineer will be the sole judge of the suitability and equivalency of the proposed substitution.

The Contractor's instrumentation personnel shall conduct regular maintenance of seismograph installations.

All seismographs shall have been calibrated by the manufacturer or certified calibration laboratory within one year of their use on site. A current certificate of calibration shall be submitted to the Engineer with the Contractor's data.

A record of laboratory calibration shall be provided for all vibration-monitoring instruments to be used on site. Certification shall be provided to indicate that the instruments are calibrated and maintained in accordance with the equipment manufacturer's calibration requirements and that calibrations are traceable to the U. S. National Institute of Standards and Technology (NIST).

## **VIBRATION MONITORING**

The Contractor shall furnish all installation tools, materials, and miscellaneous instrumentation components for vibration monitoring. At the above listed locations, vibration monitoring and recording shall be performed during the course of all significant impact work, when that activity occurs within 26 meters of the said facility. The 26 meters shall be measured from the edge of the construction activity.

The Contractor shall notify the Engineer at least 24 hours prior to starting a new vibration-producing construction task, and shall have the seismographs in place and functioning properly prior to any work within 26 meter as defined above. No work occurring within this zone shall occur unless monitoring equipment is functioning properly.

The equipment shall be set up in a manner such that an immediate warning is given when particle velocity equal to or exceeding 5 millimeter per second is produced. The warning emitted by the vibration-monitoring equipment shall be instantaneously transmitted to the responsible person designated by the Contractor by means of warning lights, audible sounds or electronic transmission.

Monitoring equipment shall be stationed within 0.9 meter of the exterior of designated facilities on the side facing the Contractor's work site. For facilities whose frontage exceeds 60 meter, at least 2 monitors shall be utilized at that location.

The seismographs shall be installed such that the longitudinal and transverse directions of measurement are parallel and perpendicular to the feeder alignment, respectively.

When any reading on monitoring equipment equals or exceeds 10 millimeter per second, work shall immediately cease and the Contractor shall immediately notify the Engineer. If directed by the Engineer, the Contractor shall submit within 24 hours a detailed specific plan of action so that the vibration limits are not violated. The Contractor shall take whatever action is necessary to reduce and maintain the monitoring equipment reading below a particle velocity of 10 millimeter per second.

The seismograph vibration sensors shall be firmly mounted on the surface slab of concrete or asphalt, or firmly set in undisturbed soil.

## **DATA COLLECTION**

Prior to any vibration-producing construction activity, the Contractor shall collect seismograph data to document background vibrations at each monitoring location. This monitoring shall consist of a continuous recording of the maximum single-component peak particle velocities for one-minute intervals, which shall be printed on a strip chart. The background monitoring shall be performed for a minimum of two non-consecutive workdays, spanning the hours during which construction activities will take place.



The Contractor shall monitor vibration during significant vibration-producing construction activities. This monitoring shall consist of a continuous recording of the maximum single-component peak particle velocities for one-minute intervals, which shall be printed on a strip chart. During the monitoring, the Contractor shall document all events that are responsible for the measured vibration levels, and submit the documentation to the Engineer with the data as specified in section "Data Reduction, Processing, Plotting and Reporting" in these Special Provisions. A record form "Construction Vibration Monitoring Field Data Form" for documenting these events could be found in "Supplemental Project Information," of these special provisions.

All vibration monitoring data shall be recorded contemporaneously and plotted continuously on a graph by the data acquisition equipment. Each graph shall show time-domain wave traces (particle velocity versus time) for each transducer with the same vertical and horizontal axes scale.

#### **DATA REDUCTION, PROCESSING, PLOTTING AND REPORTING**

Within 10 working days after the completion of the background vibration monitoring, the Contractor shall submit to the Engineer a hard copy report documenting the results at each of the monitoring locations.

During bridge construction, the Contractor shall provide weekly, hard copy reports summarizing any vibration monitoring data collected at the specified vibration-monitoring locations. The reports for each week shall be submitted on or before the end of the following week.

All reports shall be signed by the approved Vibration Instrumentation Engineer, and shall include the following:

1. Project identification, including District, County, Route, Post Mile, Project Name and Bridge number as shown on the project plans.
2. Location of the monitoring equipment.
3. Location of vibration sources (e.g. traffic, demolition equipment, etc.)
4. Summary tables indicating the date, time and magnitude and frequency of maximum single-component peak particle velocity measured during each one-hour interval of the monitoring period.
5. Field data forms (construction vibration monitoring only).
6. Appendix graphs of the strip charts printed during the monitoring periods.

In addition to the hard copy data specified herein, the Contractor shall provide data on 90-mm diskettes with each report. Electronic data files for all instrument data shall be provided in dBASE IV (.DBF) format.

The Contractor shall not disclose any instrumentation data to third parties and shall not publish data without prior written consent of the Department.

#### **PAYMENT**

The contract lump sum price paid for vibration monitoring shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals and for performing all work involving vibration monitoring, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

### **10-1.63 PHOTO SURVEY OF EXISTING FACILITIES**

#### **GENERAL**

##### **Summary**

This work includes performing photo surveys and crack monitoring of existing facilities which could be damaged by the Contractor's operations.

The Contractor shall perform crack monitoring and photo survey of the following existing facilities:

1. Building No. 262 (Torpedo Factory), Historic Architectural Resource, (ESA 2a)
2. United States Navy – The Senior Officers' Quarters Historic District (Quarters 1 through 7), Historic Architectural Resource, and grounds (ESA 2b)
3. Quarters 8, and grounds, (ESA 2c)
4. United States Coast Guard Base – Quarters 9, B, C, 10, 24, 25, 26, 27, and 267 (garage)
5. Concrete Retaining Walls and Weir, Historic Architectural Resource, (ESA 9a, and 9b)

The Contractor shall perform photo surveys prior to and after performing the following work: pile driving, retaining wall removal, installation and removal of falsework, bridge removal, in the vicinity of these existing facilities and as directed by the Engineer. No work shall take place until the Engineer approves the first photo survey.

The photo surveys shall consist of both photographic and video recordings of the conditions (internal and external cracks, settlements, leakages, and the like) of the specified facilities including the foundation, walls, ceiling, roof, and other elements on the interiors and exteriors.

Crack monitoring shall be performed on all existing cracks with a monitoring device approved by the Engineer. The crack monitoring device shall be capable of measuring cracks to the nearest millimeter. Crack monitoring shall be performed daily throughout the duration of the pile driving, falsework, bridge removal, and as directed by the Engineer. The initial crack measurement shall be completed with the first photo survey.

Cracks shall be measured in length and width. The crack measurements shall be recorded at the same time each day in an effort to eliminate deviations in crack magnitude due to heat fluctuations.

The Contractor shall notify the Engineer 48 hours prior to beginning the photo survey and crack monitoring work.

The Contractor shall obtain consent from property owners prior to performing any photo survey or crack monitoring. Refusal of a property owner to allow photo survey or crack monitoring shall be duly documented by the Contractor.

The photo survey and crack monitoring are intended for use as indisputable evidence in ascertaining the extent of any damage which may occur as a result of the Contractor's operations. The photo survey and crack monitoring are for the protection of the property owners, the Contractor, and the State. The photo survey and crack monitoring will be the means of determining whether any damage occurred during the contract work.

The Contractor shall immediately inform the Engineer in writing of any damage to these facilities.

## **Submittals**

### **Work Plan**

Submit a work plan at least 10 working days prior to the pre-construction photo survey. The work plan shall include a schedule of activities, equipment to be used, and a comprehensive description of work to be completed at each facility, including the locations of all cracks to be monitored and a sample crack monitoring report. The Engineer shall have 5 working days to review the submittal for adequacy. If revisions are required, as determined by the Engineer, the Contractor shall revise and resubmit the work plan within 5 working days. The Contractor shall provide the Engineer with 3 copies of the approved work plan.

### **Pre-Construction and Post-Construction Photo Survey**

Submit a pre-construction photo survey at least 10 working days prior to start performing pile driving, retaining wall removal, installation and removal of falsework, and bridge removal. Submit a post-construction photo survey within 5 working days after the completion of pile driving, falsework, and bridge removal operations. The Engineer shall have 5 working days to review the pre-construction and post-construction photo survey submittals for adequacy. If revisions are required, as determined by the Engineer, the Contractor shall revise and resubmit the photo survey within 5 working days. The Contractor shall provide the Engineer with 4 copies of the approved pre-construction and post-construction photo survey.

The pre-construction and post-construction photo survey shall consist of both photographic and video recordings in digital format of the conditions of the specified facilities including the foundation, walls, ceiling, roof, and other elements on the interiors and exteriors (internal and external cracks, settlements, leakages, and the like).

Photographs shall be in color and shall have a minimum resolution of 762 dots per cm on a 20.3 cm x 25.4 cm photograph. All photographs shall be indexed, and identified by date, location, and orientation.

The video recording shall be narrated contemporaneously by the camera operator, documenting the location, orientation, time, and date of the scene. The narration may be supplemented by onscreen text either generated by the camera or by other methods approved by the Engineer. All video and audio recordings shall be made to the highest quality and standards. The video recording shall be taken in well lit conditions and capable of documenting architectural cracking in structures. All video recording shall be High Definition (HD) with 1080 horizontal lines of vertical resolution and 30 frames per second. Individual video files shall not exceed 10 minutes in length and shall be indexed, and labeled with date, location, and orientation.

HD video recordings shall be made in a format that can be edited, is free of any copy protection, and is viewable by freeware or shareware such as VLC Media Player or an acceptable equivalent. All video recordings shall be stored on a labeled single layer Digital Versatile Disk (DVD) optical disk storage media and provided to the Engineer. The index shall also be submitted in PDF format with the video recordings in the optical disk storage media.

All photos shall be stored in JPEG file format and on a labeled Compact Disc (CD), or single layer DVD optical disk storage media and provided to the Engineer. The index with date, location, and orientation shall also be submitted in PDF format with the photos in the optical disk storage media.

All video and photo optical disk storage media shall be submitted in a 3-ring binder and shall include the following: protective photo sleeves, building layout, and summary sheets indexing all photographs.

### **Crack Monitoring Report**

Submit a crack monitoring report detailing the recorded measurements and the locations of the cracks biweekly.

### **PAYMENT**

The contract lump sum price paid for photo survey of existing facilities, shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in performing photo survey and crack monitoring, including furnishing 6 sets of the approved initial and final photo survey records, as specified in these special provisions, and as directed by the Engineer.

Additional photo surveys of existing facilities other than those facilities listed under this special provision will be paid for as extra work as provided in Section 4-1.03D, "Extra Work," of the Standard Specifications.

## **10-1.64 SEWER VIDEO SURVEY**

### **GENERAL**

#### **Summary**

This work includes performing a video survey and providing an inspection report on the condition of the interior of the existing 100-mm and 300-mm vitrified clay pipe (VCP) (U.S. Navy), under jurisdiction of the San Francisco Public Utility Commission (SFPUC) Waste Water Enterprise, before and after pile driving and bridge removal.

The Contractor must coordinate with the SFPUC Waste Water Enterprise, Telephone (415) 554-0724, at least 5 working days to gain access to the sewer pipes prior to initiating any work.

#### **Submittals**

Submit the following:

1. **Operation and Safety Procedure Plan**

At least 20 working days prior to conducting the video survey of the SFPUC Waste Water Enterprise VCP pipes, submit to the Engineer for review and acceptance 4 copies of the operation and safety procedure plan. The Engineer will have 10 working days to review and accept the plan. If revisions are required, as determined by the Engineer, the Contractor must revise and resubmit the plan within 5 working days of receipt of the Engineer's comments. The Engineer will have 5 working days to review the revisions. Upon the Engineer's approval of the plan, 4 additional copies of the Operation and Safety Procedure plan incorporating the required changes must be submitted to the Engineer. Minor changes or clarifications to the initial submittal may be made and attached as amendments to the plan. In order to allow construction activities to proceed, the Engineer may conditionally approve the Operation and Safety Procedure plan while minor revisions or amendments are being completed.

2. **Contingency Plan**

At least 20 working days prior to conducting the video survey of the SFPUC Waste Water Enterprise VCP pipes, submit to the Engineer for review and acceptance 4 copies of the contingency plan. The Engineer will have 10 working days to review and accept the plan. If revisions are required, as determined by the Engineer, the Contractor must revise and resubmit the plan within 5 working days of receipt of the Engineer's comments. The Engineer will have 5 working days to review the revisions. Upon the Engineer's approval of the plan, 4 additional copies of the Contingency plan incorporating the required changes must be submitted to the Engineer. Minor changes or clarifications to the initial submittal may be made and attached as amendments to the contingency plan. In order to allow construction activities to proceed, the Engineer may conditionally approve the Contingency plan while minor revisions or amendments are being completed.

3. **Pre-Construction Inspection Report**

At least 10 working days before starting the construction of the all pile driving and bridge removal, submit 4 copies of the pre-construction inspection report to the Engineer for review and acceptance. The Engineer will have 5 working days to review and accept the report. If revisions are required, as determined by the Engineer, the Contractor must revise and resubmit the report within 5 working days of receipt of the Engineer's comments. Upon the Engineer's approval of the plan, 4 additional copies of the report

incorporating the required changes must be submitted to the Engineer. After acceptance by the Engineer the contractor must provide 2 copies of the inspection report to the SFPUC Waste Water Enterprise. The Pre-Construction inspection report must include the following:

- 3.1. The type, condition, and location of all structural deficiencies, including reduced cross sectional areas, protrusions, cracks, holes, exposed aggregates and reinforcing bars, honey combed areas, damaged or offset construction joints, deteriorated concrete surfaces, infiltrations, root intrusions, missing pieces, and the condition of the manholes and the manhole covers. The locations of all deficiencies found in the sewer pipe must be shown by distances with reference points agreed upon by the Contractor and the Engineer.
- 3.2. Continuous voice recording describing defects and features found.
- 3.3. A clear digital photo or video picture capture of all structural deficiencies found.
- 3.4. The dimensions of all major structural deficiencies found.
- 3.5. A copy of the sewer video survey in high quality electronic media. The video media must include the following information:
  - 3.5.1. Voice recording
  - 3.5.2. Recording number
  - 3.5.3. Inspection date
  - 3.5.4. Current distance along sewer (counter meter)
  - 3.5.5. Printed labels on video recording hard copy with location and date

#### 4. Post-Construction Inspection Report

At least 7 working days after the completion of all pile driving and bridge removal, submit 4 copies of the post construction inspection report to the Engineer for review and acceptance. The Engineer will have 5 working days to review and accept the report. If revisions are required, as determined by the Engineer, the Contractor must revise and resubmit the report within 5 working days of receipt of the Engineer's comments. Upon the Engineer's approval of the plan, 4 additional copies of the report incorporating the required changes must be submitted to the Engineer. After acceptance by the Engineer provide 2 copies of the inspection report to the SFPUC Waste Water Enterprise. The Post-Construction inspection report must include the following:

- 4.1. The type, condition, and location of all structural deficiencies, including reduced cross sectional areas, protrusions, cracks, holes, exposed aggregates and reinforcing bars, honey combed areas, damaged or offset construction joints, deteriorated concrete surfaces, infiltrations, root intrusions, missing pieces, and the condition of the manholes and the manhole covers. The locations of all deficiencies found in the sewer pipe must be shown by distances with reference points agreed upon by the Contractor and the Engineer.
- 4.2. Continuous voice recording describing defects and features found.
- 4.3. A clear digital photo or video picture capture of all structural deficiencies found.
- 4.4. The dimensions of all major structural deficiencies found.
- 4.5. A copy of the sewer video survey in high quality electronic media. The video media must include the following information:
  - 4.5.1. Voice Recording
  - 4.5.2. Recording number
  - 4.5.3. Inspection date
  - 4.5.4. Current distance along sewer pipe (counter meter)
  - 4.5.5. Printed labels on video recording hard copy with location and date
- 4.6. Comparison of findings between the pre and post construction surveys.
- 4.7. Possible cost effective solutions to remedy the major structural deficiencies identified and the serviceability of the existing SFPUC Waste Water Enterprise VCP pipes.

#### **Quality Control and Assurance**

Qualifications: Experienced Contractor's personnel trained in identifying and locating defects, breaks, and obstacles must perform the SFPUC Waste Water Enterprise pipe video inspection.

## **MATERIALS**

### **Closed-Circuit Television (CCTV) Inspection Equipment**

CCTV equipment must include:

1. CCTV color camera with articulating head that pans and rotates 360 degrees.
2. Transporter adapted for conditions of the pipe
3. Television monitor
4. Lighting
5. Cables and power sources

CCTV equipment must:

1. Be specifically designed and constructed for pipe inspection
2. Be operative in 100% humidity conditions
3. Have camera lighting that allows a clear view of the entire periphery
4. Have adjustable focal distance range from 150-mm to infinity
5. Produce a minimum 356 lines of resolution for camera and monitor
6. Have remote reading meter counter accurate to 1 percent over the length of the particular section being inspected

### **Calibration**

Verify the accuracy of the distance meter used in CCTV inspection with a Rollatape measuring wheel or other suitable device approved by the Engineer.

### **Electronic Media**

CCTV recording must be made in high quality electronic media such as Compact Disk (CD) or Digital Video Disk (DVD).

## **CONSTRUCTION**

### **General**

The Contractor must inspect the sewer pipe either by human entry or CCTV equipment.

When using CCTV equipment for inspection, the Contractor must provide a full 360-degree view video survey of the interior of the sewer pipe. The CCTV inspection rate must not exceed 9 -m per minute.

To gain access, the Contractor must inform and coordinate with the Engineer and SFPUC Waste Water Enterprise 20 working days in advance of the planned sewer pipe video survey. The Contractor must not perform the video survey work without the presence of a SFPUC Waste Water Enterprise representative.

The SFPUC Waste Water Enterprise 100 mm VCP can be accessed through manholes located within the State right of way between 70 meters Rt. E 50+60 to 95 meters Rt. E 50+70. The SFPUC Waste Water Enterprise 300 mm VCP can be accessed through manholes located within the State right of way between 55 meters Rt. E 54+25 to 40 meters Rt. E 54+42. Opening manhole covers will require lifting padeyes, eyebolts and a crane or other lifting equipment.

A shutdown of SFPUC Waste Water Enterprise pipe must take place in order to restrict flow in the outfall pipe for the video survey to take place. The pipe can only be shut down from 1:00 a.m. to 5:00 a.m. Shutdowns are also limited by the status of treatment plant functions and weather conditions, current and forecasted. The Contractor must ensure that all work is complete and manhole covers are properly secured in place before 6:00 a.m. The Contractor must notify any affected residents 5 working days in advance of the planned shutdown.

A written System Outage Request (SOR) must be submitted to the Engineer 10 working days in advance of the planned video survey. The SOR must be approved by the Engineer before each video inspection survey.

### **Video Survey Locations**

The video survey must be conducted at the following location:

1. SFPUC Waste Water Enterprise 100 mm VCP from 70 m Rt. E 50+60 to 95 m Rt 50+70
2. SFPUC Waste Water Enterprise 300 mm VCP from 55 m Rt. E 54+25 to 40 m Rt 54+42

## **Safety Procedures**

In addition to the requirements specified in this special provision, the Contractor must comply with all applicable Federal, State, and local safety and health requirements and standards.

The Contractor must:

1. Provide personal protective equipment to Contractor's personnel, the Engineer, and SFPUC Waste Water Enterprise as required by job conditions.
2. Coordinate lockout/tagout procedures with SFPUC Waste Water Enterprise as needed. The Contractor must be ready to apply locks and tags in conjunction with SFPUC Waste Water Enterprise during sewer pipe entry. The Contractor must be in constant contact with SFPUC Waste Water Enterprise and the Engineer during the duration of the sewer pipe shutdowns.
3. Provide safeguards, including traffic barriers, warning signs, barricades, temporary fences and other similar safeguards when required for the protection of all personnel during the sewer video survey.

## **Testing**

The SFPUC Waste Water Enterprise 100 mm VCP can be accessed through manholes located within the State right of way between 70 meters Rt. E 50+60 to 95 meters Rt. E 50+70. The SFPUC Waste Water Enterprise 300 mm VCP can be accessed through manholes located within

Testing must take place for the following suspected conditions prior to entering the sewer pipe:

1. Combustible gases
2. Hydrogen sulfide (H<sub>2</sub>S)
3. Contaminated and infectious waste

Testing must take place for the following suspected conditions at all times during inspection:

1. Combustible gases
2. Hydrogen sulfide (H<sub>2</sub>S)
3. Oxygen deficiencies
4. Carbon dioxide
5. Carbon monoxide

## **PAYMENT**

The contract lump sum price paid for sewer video survey includes full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in conducting the video survey, including preparing submittals, providing Pre and Post-Construction inspection reports, electronic media, inspection documentation, personal protective equipment, safety devices, testing, and cleaning as necessary to facilitate the video survey and inspection, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

### **10-1.65 CLEARING AND GRUBBING**

Clearing and grubbing shall conform to the provisions in Section 16, "Clearing and Grubbing," of the Standard Specifications and these special provisions.

Attention is directed to "Handling, Transportation, and Disposal of Contaminated Material," of these special provisions.

Clearing and Grubbing operations shall result in no visible dust.

Attention is directed to "Order of Work," and "Environmentally Sensitive Areas (Generals)," of these special provisions, regarding preconstruction predisturbance surveys to be performed by the biologist.

Vegetation shall be cleared and grubbed only within the excavation and embankment slope lines.

### **10-1.66 EARTHWORK**

Earthwork shall conform to the provisions in Section 19, "Earthwork," of the Standard Specifications and these special provisions.

When a layer of specified material is not to be placed on the basement material, the finished grading plane shall not vary more than 30 mm above or below the grade established by the Engineer. The requirements for obtaining a relative compaction of 95 percent, as provided in the first 2 paragraphs in Section 19-5.03, "Relative Compaction (95 Percent)," of the Standard Specifications, shall not apply when a layer of specified material is not to be placed on the basement material.

The grading plane of embankments beneath structure approach slabs and beneath the thickened portion of sleeper slabs shall not project above the grade established by the Engineer.

Surplus excavated material shall become the property of the Contractor and shall be disposed of in conformance with the provisions in Section 7-1.13, "Disposal of Material Outside the Highway Right of Way," of the Standard Specifications.

Where a portion of the existing surfacing is to be removed, the outline of the area to be removed shall be cut on a neat line with a power-driven saw to a minimum depth of 50 mm before removing the surfacing. Full compensation for cutting the existing surfacing shall be considered as included in the contract price paid per cubic meter for roadway excavation and no additional compensation will be allowed therefor.

Reinforcement or metal attached to reinforced concrete rubble placed in embankments shall not protrude above the grading plane. Prior to placement within 0.6-m below the grading plane of embankments, reinforcement or metal shall be trimmed to no greater than 20 mm from the face of reinforced concrete rubble. Full compensation for trimming reinforcement or metal shall be considered as included in the contract prices paid per cubic meter for the types of excavation shown in the Engineer's estimate, or the contract prices paid for furnishing and placing imported borrow or embankment material, as the case may be, and no additional compensation will be allowed therefor.

Imported borrow shall be mineral material including rock, sand, gravel, or earth. The Contractor shall not use man-made refuse in imported borrow including:

- A. Portland cement concrete
- B. Asphalt concrete
- C. Hot mix asphalt
- D. Material planed from roadway surfaces
- E. Residue from grooving or grinding operations
- F. Metal
- G. Rubber
- H. Mixed debris
- I. Rubble

Roughen embankment slopes to receive erosion control materials by either trackwalking or rolling with a sheepfoot roller. Trackwalk slopes by running track mounted equipment perpendicular to slope contours.

Full compensation for roughening is included in the contract price paid per cubic meter for roadway excavation and no additional compensation will be allowed.

## **SOLDIER PILE WALL EARTHWORK**

### **General**

Cross sections of the site in the vicinity of the soldier pile wall are included in "Supplemental Project Information," of these special provisions as information available for inspection and are available to the Contractor in conformance with the provisions in Section 2-1.03, "Examination of Plans, Specifications, Contract, and Site of Work," of the Standard Specifications.

The Contractor shall submit to the Engineer working drawings, including design calculations, and a construction sequence for the proposed method of soldier pile wall construction for the site in conformance with the provisions in "Working Drawings," of these special provisions. The drawings and calculations shall be signed by an engineer who is registered as a Civil Engineer in the State of California. One set of the drawings and construction sequence, and one copy of the design calculations, shall be furnished to the Engineer. The working drawings and construction sequence shall include, but not be limited to, defining order of work, traffic control, method of installation of soldier piles, method of placing lagging, limits of structure excavation lifts, and type of drilling and excavation equipment to be used. The Contractor shall allow three weeks after complete drawings and support data are submitted for the review and approval of the proposed method of soldier pile wall construction.

In the event the Engineer fails to complete the review and approval within the time allowed, and if, in the opinion of the Engineer, completion of the work is delayed or interfered with by reason of the Engineer's delay in completing the review, the Contractor will be compensated for any resulting loss, and an extension of time will be granted, in the same manner as provided in Section 8-1.09, "Right of Way Delays," of the Standard Specifications.

### **Structure Excavation (Soldier Pile Wall)**

Construction of the soldier pile wall shall proceed in lifts from the bottom up as shown on the plans.

### **Structure Backfill (Soldier Pile Wall)**

Material for structure backfill behind lagging shall conform to the provisions in Section 19-3, "Structure Excavation and Backfill," of the Standard Specifications. Structure backfill behind lagging shall be compacted by hand tamping, mechanical compaction, or other means approved by the Engineer.

Structure backfill in fill areas behind the lagging shall be keyed into the existing or excavated back slope.

Backfill behind the lagging shall be in place and compacted to 1.5 m above the level of the tiebacks prior to drilling for the tiebacks. The remainder of the backfill behind the lagging shall be placed and compacted after tiebacks are drilled, stressed, and grouted.

### **Concrete Backfill**

Concrete backfill of the types listed in the engineer's estimate encasing the steel soldier piles below the lagging shall be Class 2 concrete conforming to the provisions in Section 90, "Portland Cement Concrete," of the Standard Specifications and these special provisions.

### **GEOCOMPOSITE DRAIN**

Geocomposite drain to be placed at Retaining Wall No. 51 (Soldier Pile Wall), and Retaining Walls No. 52 and No. 54 shall conform to the details shown on the plans and these special provisions.

Geocomposite drain shall consist of a manufactured core not less than 6.35 mm thick nor more than 50 mm thick with one or both sides covered with a layer of filter fabric that will provide a drainage void. The drain shall produce a flow rate through the drainage void of at least 25 liters per minute per meter of width at a hydraulic gradient of 1.0 and a minimum externally applied pressure of 168 kPa.

A Certificate of Compliance conforming to the provisions in Section 6-1.07, "Certificates of Compliance," of the Standard Specifications shall be furnished for the geocomposite drain certifying that the drain complies with these special provisions. The Certificate of Compliance shall be accompanied by a flow capability graph for the geocomposite drain showing flow rates and the externally applied pressures and hydraulic gradients. The flow capability graph shall be stamped with the verification of an independent testing laboratory.

The manufactured core shall be one of the following:

1. Preformed grid of embossed plastic
2. Mat of random shapes of plastic fibers
3. Drainage net consisting of a uniform pattern of polymeric strands forming 2 sets of continuous flow channels
4. System of plastic pillars and interconnections forming a semirigid mat

The core material and filter fabric shall be capable of maintaining the drainage void for the entire height of geocomposite drain. Filter fabric shall be integrally bonded to the side of the core material with the drainage void.

### **Filter Fabric**

Filter fabric shall comply with the specifications for filter fabric for underdrains in Section 88, "Engineering Fabrics," of the Standard Specifications.

### **Treated Permeable Base at Bottom of Geocomposite Drains**

Treated permeable base to be placed around the slotted plastic pipe at the bottom of geocomposite drains shall be an asphalt treated permeable base or a cement treated permeable base as specified in Section 29, "Treated Permeable Bases," of the Standard Specifications.

Pervious backfill material placed within the limits of payment for Type 6 retaining wall, and retaining walls No 8, 53, and 55 will be measured and paid for as structure backfill (retaining wall).

If structure excavation or structure backfill for bridges is not otherwise designated by type and payment for the structure excavation or structure backfill has not otherwise been provided for in the Standard Specifications or these special provisions, the structure excavation or structure backfill will be measured and paid for as structure excavation (bridge) or structure backfill (bridge), respectively.

### **Payment**

Concrete backfill encasing steel soldier piles below the lagging will be measured and paid for by the cubic meter as concrete backfill of the types listed in the Engineer's Estimate in the same manner specified for structure backfill in Section 19-3.07, "Measurement," and Section 19-3.08, "Payment," of the Standard Specifications.



Full compensation for working drawings and construction sequence, and temporary supports and shoring, if required, for soldier pile wall construction shall be considered as included in the contract price paid per cubic meter for structure backfill (soldier pile wall) and no additional compensation will be allowed therefor.

Full compensation for filter fabric, geocomposite drain, plastic pipes, PVC pipes, weep hole pipes and all accessories for pipes as shown on the plans for soldier pile wall shall be considered as included in the contract price paid per cubic meter for structure backfill (soldier pile wall) and no additional compensation will be allowed therefor.

Full compensation for filter fabric, geocomposite drain, treated permeable base, plastic pipes (slotted), and all accessories for pipes as shown on the plans for reinforced concrete wall (retaining wall No. 52) shall be considered as included in the contract price paid per cubic meter for structure backfill (retaining wall) and no additional compensation will be allowed therefor.

### TEMPORARY SHORING

Excavations for footings at locations where temporary shoring is to be used shall conform to the requirements in Section 5-1.02A, "Excavation Safety Plans," of the Standard Specifications, these special provisions and the following additional requirements:

- A. The Contractor shall submit detailed plans and design calculations at least 8 weeks before the Contractor intends to begin excavation.
- B. At locations where groundwater is encountered and water levels are higher outside than within the excavation, the unbalanced hydrostatic load shall be added to the recommended lateral earth pressures, and consideration shall be given in the design for the adverse effects of pore water pressure, seepage, and uplift of the soil.
- C. Calculation of soil passive pressure used in resisting lateral loads shall include a reduction factor due to the presence of sloped surfaces where applicable.

Footings for bents listed in the table below are located in sloping hillsides:

STRUCTURE	BENT	FOOTING
YBI EB ON-RAMP (FINAL)	W10	ALL

In addition to the requirements listed above, excavations for footings located in sloping hillsides shall meet the following additional requirements:

- 1 Shoring design shall meet the requirements of Caltrans Bridge Design Specification Sections and Trenching & Shoring Manual. Where cantilevered or braced shoring is used, design lateral earth pressures shall not be less than the values determined from the following Figure 1. The pressures are based on average soil conditions. The effect of any dead load or live load surcharge shall be added to the indicated earth pressures.
- 2. Where soil nail walls are used as temporary shoring, they shall be designed in accordance with the criteria provided in FHWA Report No. 40-IF-03-017, "Geotechnical Engineering Circular No. 7". The front face of soil nail walls over 8.0 m height shall not be steeper than 1H to 6V. The front face of soil nail walls over 11.0 m height shall include a landing at least 2.4 m wide at mid height. An ultimate bond strength of 70 kPa shall apply between the grout surrounding soil nails and the soil.
- 3. Shoring shall incorporate a drainage system to ensure there is no build-up of water pressure behind the shoring. Means & method shall include surficial slope stabilization and drainage of surface water away from the excavations.
- 4. Shoring shall be designed for earthquake loading with a minimum seismic acceleration of 0.20 g.

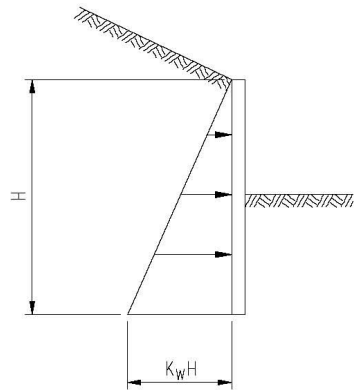


Figure 1a: Lateral Active Design Earth Pressure for Cantilever Shoring

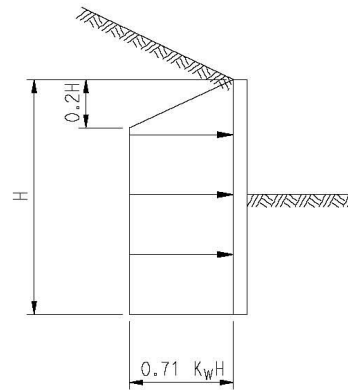


Figure 1b: Lateral Active Design Earth Pressure for Braced Shoring

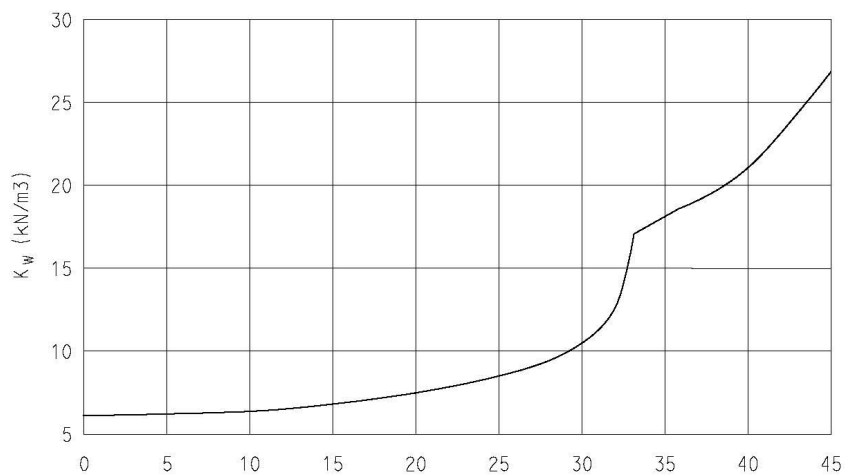


Figure 1c: Backslope (Degrees)

FIGURE 1 - MINIMUM LATERAL ACTIVE EARTH PRESSURES AGAINST SHORING

File = Transfers on 'Mne\bs1'\Fsamson\For Jal\Fig 1 Earth Pressure Chart.dgn

## **STRUCTURE BACKFILL (BRIDGE) (CEMENT MODIFIED)**

Structure backfill (bridge) (cement modified) required at Bent W10 footing as shown on the plans shall consist of soil material, portland cement, and water uniformly mixed, compacted, finished, and cured in accordance with these special provisions.

Portland cement used in structure backfill (bridge) (cement modified) shall conform to the provisions in Section 90-2.01A, "Cement," of the Standard Specifications.

Water used for structure backfill (bridge) (cement modified) shall be free from oil, salts and other impurities which would have an adverse effect on the quality of the backfill material.

Soil material for structure backfill (bridge) (cement modified) shall conform to the provisions in Section 19-3.06 "Structure Backfill," of the Standard Specifications.

Soil cement mixture shall contain not less than six percent cement by weight.

No soil-cement mixture shall be placed when air temperature is less than 5 degrees Celsius in the shade.

The operations of adding cement and water to the soil, mixing, hauling, spreading, compacting, and finishing shall be continuous and completed in daylight. Compaction shall be started within one hour and completed within two hours after the addition of cement.

Mixing may be accomplished in a transverse rotary mixer or other similar equipment approved by the Engineer. Blending shall continue until a uniform color of the mixture is achieved.

The moisture content of the backfill material shall be between optimum and two percent above optimum as determined by ASTM Designation: D1557 immediately before mixing.

Backfill material shall be compacted to a relative compaction of not less than 90 percent of maximum dry density as determined by ASTM Designation: D558, except within 1.0 m of column isolation sleeves where relative compaction shall be limited to no more than 90 percent.

After compaction, the exposed surface receiving the next lift shall be roughened with a broom.

Successive lifts shall be placed not more than two hours after finishing of the previous lift. The daylighting portion of the lift shall be stepped to retain the topsoil as shown on the plans.

Exposed backfill shall be protected against drying by curing in conformance with the water method or waterproof membrane method specified in Section 90-7.01, "Methods of Curing," of the Standard Specifications for a minimum of 72 hours after the final lift is placed. Curing shall commence as soon as practicable after placement and compaction, and shall in no case be delayed until after drying becomes evident or graying of the surface occurs.

## **MEASUREMENT AND PAYMENT**

Structure backfill (bridge) (cement modified) will be measured in cubic meters from the limits shown on the plans.

The contract price paid per cubic meter for structure backfill (bridge) (cement modified) shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals and for doing all the work involved in structure backfill (bridge) (cement modified) complete in place, including mixing, placing and compacting backfill as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

## **10-1.67 HANDLING, TRANSPORTATION, AND DISPOSAL OF CONTAMINATED MATERIAL**

### **GENERAL**

#### **Summary**

This work includes temporary storage, confirmation testing, transportation, and disposal of contaminated material.

Comply with Section 19, "Earthwork," of the Standard Specifications.

Test results used to determine the nature and extent of contaminated material are provided as described in "Supplemental Project Information," of these special provisions.

#### **Definitions**

**Class II waste:** Contaminated material that is not regulated as a hazardous waste but requires handling as a designated waste under Water Code § 13173. Designated as roadway excavation (Class II) or structure excavation (Class II). Does not include rock.

**Resource Conservation and Recovery Act (RCRA):** Federal law that provides guidelines for managing solid waste.

**Non-RCRA hazardous waste:** Contaminated material regulated as a hazardous waste under California law but not under RCRA. Also known as California hazardous waste. Designated as roadway excavation (Type H) or structure excavation (Type H). Does not include rock.

## **Submittals**

**Soil Management Plan:** At least 20 days before starting clearing and grubbing or earthwork at the job site, submit a soil management plan that includes:

1. Schedule of activities
2. Method of excavation and equipment to be used
3. Dust control procedures
4. Storage methods and locations for contaminated material
5. Haul routes and equipment
6. Spill contingency plan
7. Air monitoring
  - 7.1. Location and type of equipment
  - 7.2. Sampling frequency
  - 7.3. Analytical laboratory
8. Method for preventing spills and tracking material onto public roads
9. Truck waiting and staging areas
10. Disposal sites
11. Example manifest(s)

The Engineer reviews the soil management plan within 15 days. Resubmit required revisions within 5 days. Do not start clearing and grubbing or earthwork until the plan is accepted by the Engineer. No adjustment for time or money is made if resubmittals of the work plan are required due to deficiencies in the plan.

**Waste Disposal Documents:** Submit a disposal facility waste disposal request for the Engineer's signature.

Before transporting hazardous waste, submit a copy of the transporter's valid hazardous waste transporter registration.

Submit completed waste shipment forms and disposal facility weight tickets within 35 days after shipment. The Department withholds payment until the completed forms are submitted.

**Sampling and Analysis Plan:** At least 20 days before starting material sampling, submit a sampling and analysis plan (SAP). The SAP must be signed by a California registered professional engineer or California registered professional geologist experienced in contaminated site characterization. The SAP must include:

1. Purpose and scope of the investigation, including:
  - 1.1. Additional disposal facility requirements
  - 1.2. Reclassification of material
  - 1.3. Characterization of material outside of the excavation pay limits
2. Sampling locations and methods
3. Analytical methods
4. Name, address, and Environmental Laboratory Accreditation Program certification number of the testing laboratory
5. Quality assurance/quality control procedures

Base the sampling and analysis procedures on guidelines in:

1. USEPA, SW 846, "Test Methods for Evaluating Solid Waste, Volume II: Field Manual Physical/Chemical Methods"
2. ASTM, D 1452, "Soil Investigation and Sampling by Auger Borings"
3. ASTM, D 1586, "Penetration Test and Split-Barrel Sampling of Soils"
4. ASTM, D 1587, "Thin-Walled Tube Sampling of Soils for Geotechnical Purposes"
5. ASTM, D 6282-98(2005), "Standard Guide for Direct Push Soil Sampling for Environmental Site Characterizations"

The Engineer reviews the SAP within 15 days. Resubmit required revisions within 5 days. Do not start sampling until the plan is approved by the Engineer. No adjustment for time or money will be made if resubmittals of the SAP are required due to deficiencies in the plan.

### **Quality Control and Assurance**

**Regulatory Requirements:** Laws and regulations that govern this work include:

1. Health and Safety Code, Div 20, Ch 6.5 (California Hazardous Waste Control Act)
2. 22 CA Code of Regs, Div 4.5 (Environmental Health Standards for the Management of Hazardous Waste)
3. 8 CA Code of Regs
4. Water Code § 13173

**Permits and Licenses:** Obtain all permits and licenses, pay all charges and fees, and give all notices necessary and incident to the due and lawful prosecution of the work, including registration for transporting vehicles carrying hazardous waste, under Section 7-1.04, "Permits and Licenses," of the Standard Specifications.

For hazardous waste disposal, the Engineer obtains the Environmental Protection Agency generator identification number and Board of Equalization identification number and signs all manifests as the generator. Notify the Engineer at least 5 days before starting waste transport and at least 24 hours before subsequent loads when there is a break in hauling of more than 5 days.

### **CONSTRUCTION**

Apply water to control dust at all times while performing clearing and grubbing or earthwork activities in work areas containing contaminated material. Apply water under Section 17, "Watering," of the Standard Specifications. Excavation, transportation, storage, and handling of contaminated material must result in no visible dust migration off the job site.

Prevent mixing of contaminated material with uncontaminated material. No additional payment is made for material requiring reclassification because of failure to segregate the material after excavation.

Characterization and disposal of additional material from excavations performed outside of the pay limits are included in the contract price for excavation. Assume the material has the same handling, transportation and disposal requirements as adjacent material. Furnish replacement material suitable for the planned use under Section 19, "Earthwork," of the Standard Specifications.

### **Temporary Storage**

Transfer contaminated material directly from the excavation to any of the following:

1. Transport vehicles
2. Storage containers
3. Stockpile locations approved by the Engineer

Construct stockpile locations as follows:

1. The stockpiled material must not contain free liquids that separate readily.
2. Furnish and place undamaged chemically resistant geomembrane liners.
  - 2.1. Non-reinforced liner must be at least 0.5-mm thick.
  - 2.2. Scrim-reinforced liner must have a minimum weight of 20 kg/100 square meters.
3. Furnish and place undamaged geomembrane covers.
  - 3.1. Non-reinforced liner must be at least 0.25-mm thick.
  - 3.2. Scrim-reinforced liner must have a minimum weight of 13 kg/100 square meters.
4. The dimensions of the geomembrane must exceed the dimensions of the stockpile at all times.
5. Seal the seams in multiple geomembrane liners to prevent leakage.
6. Cover stockpiles at the end of each day or before storm events to prevent windblown dispersion and precipitation run-off and run-on.
7. If more than one sheet is required to cover the material, overlap the sheets a minimum of 450 mm.

8. Secure the cover to keep it in place. Do not use driven anchors except at the perimeter of the stockpile. Inspection and maintenance must comply with "Water Pollution Control" of these special provisions.

These stockpiling requirements apply to temporary storage outside of an excavation or a transport container including:

1. Staging of excavated material next to the excavation before pick up by loading equipment
2. Accumulating material for full transport loads
3. Awaiting test results required by a disposal facility

Start removing storage containers and stockpiles containing hazardous waste within 90 days of accumulating any quantity of material. After final removal has occurred, complete any cleanup required by the Engineer.

### **Sampling and Analysis**

Test the material for any additional acceptance requirements requested by the disposal facility or for confirmation of classifications specified on the plans or in the special provisions. Use sampling and analysis procedures approved by the Engineer and the disposal facility. Prepare and submit a sampling and analysis plan before starting any tests.

The Engineer makes the final decision on reclassification or characterization of material after review of the test results. Allow 5 business days for review of test results. Changes in classification of materials will comply with Section 4-1.03, "Changes," of the Standard Specifications.

### **Transportation**

Prepare a uniform hazardous waste manifest for each load of hazardous waste using the appropriate waste code. Transport hazardous waste using a transporter registered with the Department of Toxic Substances Control.

Cover the cargo during transport to prevent spillage or dust release. You agree to indemnify the State from any cost or liability due to spillage during transport of contaminated material to a disposal facility.

### **Disposal**

Dispose of contaminated material as follows:

1. Roadway excavation (Type H) or structure excavation (Type H) – Haul and dispose of the material at a permitted non-RCRA hazardous waste management facility.

Obtain waste disposal approval from the appropriate disposal facility. Type H material is not eligible for an exemption to the Board of Equalization disposal fees as provided under Health and Safety Code §§ 25174.1 and 25174.7.

## **MEASUREMENT AND PAYMENT**

Quantities of roadway excavation and structure excavation, of the types shown in the Engineer's Estimate, will be measured in the same manner specified for roadway excavation and structure excavation in Section 19, "Earthwork," of the Standard Specifications.

Full compensation for handling, transportation, and disposal of non-RCRA hazardous waste is included in the contract price paid per cubic meter for roadway excavation (Type H) and no additional compensation will be allowed therefor.

### **10-1.68 GEOSYNTHETIC REINFORCED EMBANKMENT**

This work shall consist of placing geosynthetic reinforcement between layers of compacted fill in conformance with the details shown on the plans at the following locations, as specified in Section 19 "Earthwork," of the Standard Specifications and these special provisions.

1. Southgate Road (Locations 1 and 2)
2. Gabion Wall, at the Embankment Confinement System (Location 1)
3. Along Slope of Embankment Confinement System (Locations 1, 2, and 3)

Drainage system and other facilities shall be constructed in the geosynthetic reinforced embankment in conformance with the details shown on the plans and these special provisions.

## **MATERIALS**

### **Geosynthetic Reinforcement**

Only one type of geosynthetic reinforcement material shall be used for an entire embankment, except as shown on the plans.

Geosynthetic reinforcement material shall be designed for use in subsurface geotechnical slope reinforcement applications. Geosynthetic reinforcement material shall be configured as a geogrid. Geogrid shall have a regular and defined open area. Geogrid shall provide pullout resistance from the soil by a combination of soils shearing friction on the plane surfaces parallel to the direction of shearing and soils bearing on transverse grid surfaces normal to the direction of grid movement. The percentage of the open area for geogrids shall range from 50 to 90 percent of the total projection of a section of the material.

### **Material Properties**

Geosynthetic reinforcement shall meet the following requirements:

1. Geosynthetic reinforcement shall have Long Term Design Strength (LTDS) in the primary strength direction greater or equal to values shown on the plans or the following table:

Locations	Geosynthetic Reinforcement Type	LTDS (kN/m)
Southgate Road (Locations 1 and 2)	Geogrid	42
Gabion Wall	Geogrid	42
Along Slope Embankment Confinement System (Locations 1, 2 and 3)	Geogrid	8.5

LTDS for geosynthetic reinforcement shall be determined by Standard Practice GRI GG4a for stiff geogrids and GRI GG4b for flexible geogrids, and GT7 for geotextiles, respectively. These values shall be minimum average roll values in the machine direction.

2. Reduction factors applied to the ultimate strength are determined in accordance with GRI GG4a, GRI GG4b, and GRI GT7. The product of the reduction factors of less than 1.30 is not allowed. The reduction factor for creep shall be determined for a 75-year design life as determined by GRI GG4a and GRI GG4b for geogrids and GRI GT7 for geotextiles.
3. In the absence of specific test data, the default values of reduction factors (installation damage, creep, chemical degradation, biological degradation, and joint) as indicated in the Standard Practice GRI GG4a and GRI GG4b and GRI GT7 shall be applied to the calculations of the LTDS.
4. Geosynthetic reinforcement material shall be resistant to naturally occurring alkaline and acidic soil conditions, and to attack by bacteria.

All test results used in the calculations of the LTDS shall be submitted to the Engineer no less than 15 working days prior to placement of the geosynthetic reinforcement. The calculations shall itemize each reduction factors. Splice efficiency shall be accounted for in the calculations. All test results that contribute to the calculations of the LTDS shall be prepared and signed by a California-registered Civil Engineer.

Geosynthetic reinforcement shall consist of high density polyethylene, or polypropylene.

Geosynthetic reinforcement consisting of high density polyethylene shall be manufactured from high density polyethylene (HDPE) which conforms to ASTM Designation: D 1248.

Geosynthetic reinforcement consisting of polypropylene sheets shall meet the requirements of ASTM Designation: D 4101, Group 1/Class1/Grade 2.

A certificate of compliance shall be furnished to the Engineer in conformance with Section 6-1.07, "Certificate of Compliance," of the Standard Specifications a minimum of one week prior to placement of geosynthetic reinforcement. The Certificate of Compliance shall be prepared and signed by a representative of the manufacturer who is a California-registered Civil Engineer.

### **Delivery, Handling, and Storage**

Geosynthetic reinforcement shall be furnished in an appropriate protective cover which shall protect it from ultraviolet radiation and from abrasion during shipping and handling.

The Contractor shall check products upon delivery to assure that the Geosynthetic reinforcement received is dry and undamaged. Each roll shall be labeled with the manufacturer's name, production identification, roll dimensions, lot number, and date manufactured.

Geosynthetic reinforcement shall be handled and stored in accordance with the manufacturer's recommendations.

Geosynthetic rolls shall be protected from construction equipment, chemicals, sparks and flames, temperatures in excess of 70 °C, and any other environmental conditions that may degrade physical properties. To prevent geosynthetic material from being saturated, if stored outdoors, the rolls shall be elevated from the ground surface or placed on a sacrificial sheet of plastic in an area where water will not accumulate. Geogrids, except for extruded grids, shall be protected with an opaque waterproof cover.

### **EMBANKMENT BACKFILL**

The material shall be free from organic material and substantially free from shale or other soft, poor durability particles; shall not contain recycled materials, such as glass, shredded tires, Portland cement concrete rubble, asphaltic concrete rubble, or other unsuitable materials as determined by the Engineer; and shall conform to the following requirements:

PROPERTY	VALUE	CA TEST NO.
Sieve Size, mm	Percent Passing	202
37.5	100	202
19	75-100	202
4.75	20-75	202
0.42	0-60	202
0.075	0-15	202
Quality Requirements		
Test	Operating	
Sand Equivalent	8 min	217
Plasticity Index	10 max	204
pH	5 to 9	643

### **CONSTRUCTION**

Slope excavation, placement of reinforcement, and backfill shall proceed in slots not exceeding 61 linear meters in length measured along "SG" station line.

#### **Subgrade Preparation**

The Contractor shall prepare the grade that is to receive the layers of geosynthetic reinforcement to the compaction and elevation tolerances described in the Standard Specifications under Section 19-2.05, "Slopes," and these special provisions. The grade shall be smooth and free of loose or extraneous material and objects that may damage the geosynthetic reinforcement during installation. Relative compaction of not less than 95 percent shall be obtained in the embankment foundation for a minimum depth of 0.15 meter.

#### **Geosynthetic Reinforcement Placement**

Geosynthetic reinforcement shall be handled and placed in accordance with the manufacturer's recommendations and these special provisions. The geosynthetic reinforcement shall be placed wrinkle free, pulled taut, aligned, and secured before backfill placement to prevent the displacement during placement and compaction of fill.

The geosynthetic reinforcement material shall be placed with the direction of maximum strength perpendicular to the slope alignment. The Contractor shall verify correct orientation of the geosynthetic reinforcement. Each layer of geosynthetic reinforcement shall be placed onto the embankment material to form a continuous mat. Adjacent strips of geosynthetic reinforcement placed in this manner need not be overlapped.

Geosynthetic reinforcement shall be placed at the intervals, elevations, and for the minimum embedment length shown on the plans. Each layer of geosynthetic reinforcement shall not vary more than 0.15 meter from the theoretical horizontal plane established for that layer for the entire width and length of the reinforcement. All reinforcement shall be 100 percent covered by soil so that reinforcement panels do not contact in overlaps. Geosynthetic reinforcement shall be placed and covered with backfill in the same work shift.



During spreading and compacting of the backfill, a minimum fill thickness of 0.15 m is required prior to operation of vehicles over the reinforcement. Sudden braking and sharp turning shall be avoided. Construction equipment shall not be operated or driven directly on the reinforcement.

During spreading and compacting of the backfill, at the option of the Engineer, rubber tired vehicles may be driven directly on the material, provided that such traffic is part of the placement operation, that the amount of traffic repetitions is minimized, that speeds of 9.7 km/h or less are maintained, that turning or stopping movements of the vehicle are minimized, and no damage or displacement to the reinforcement is observed.

Geosynthetic reinforcement shall not extend into the pavement structural section.

At locations where guard railing posts will be placed at the top crest of the geosynthetic reinforced embankment and the geosynthetic reinforcement would interfere with placement of such posts, prior to backfilling the Contractor shall be allowed to precut the reinforcement material of the affected layers into a cross-shaped pattern to aid the later placement of the guard railing posts. The dimensions of the precutting shall not exceed the post dimensions by more than 750 millimeters.

Each layer of geosynthetic reinforcement shall be placed (unrolled) into the grade to form a continuous mat. A minimum of 75 mm of compacted fill material shall be required between geosynthetic reinforcement layers, unless shown otherwise on the plans.

For geotextiles, no splicing joints parallel to slope alignment shall be allowed. Geogrid reinforcement may be joined with mechanical connectors in accordance with Manufacturer's recommendations. Joints shall not be placed vertically within 2 meters of the slope face, within 2 meters of the slope top, nor horizontally or vertically adjacent (within 1.2 meters) to another joint. Only one joint per length of geogrid shall be allowed. The joint shall be made for the full width of the strip by using a similar material with similar strength, and using a connection device supplied or recommended by the manufacturer. Joints in geogrid shall be pulled and held taut during backfill placement.

If the geosynthetic reinforcement is damaged during construction operations, the damaged sections shall be repaired, at the Contractor's expense, by placing additional geosynthetic reinforcement to cover the damaged area and to meet the following overlap requirements:

1. Edges of geogrid perpendicular to slope alignment shall be overlapped for entire lengths of 0.61 meters. Edges of geogrid parallel to slope alignment shall be joined using a mechanical connection described elsewhere in these special provisions.
2. Edges of geotextiles shall be overlapped a minimum of 0.45 meters on all sides.

#### **Fill Placement**

Reinforced fill shall be placed from the slope face back toward the fill area to ensure that the reinforcement remains taut. The maximum loose thickness of each lift of embankment material shall not exceed 0.3 meter and shall be compacted to 90% Relative Compaction.

At locations where compaction is accomplished with hand-operated equipment, fill shall be placed in horizontal layers not more than 0.15 m in uncompacted thickness. Only hand-operated equipment shall be allowed within one meter of the front limit of geosynthetic reinforcement and underground structures.

Control of moisture in the fill shall be maintained to provide acceptable compaction. Disking and plowing will not be allowed in the reinforced zone.

#### **MEASUREMENT AND PAYMENT**

Geosynthetic reinforcement embankment will be measured and paid for by the square meter from dimensions shown on the plans not including additional geosynthetic reinforcement required for overlaps.

The contract price paid per square meter for geosynthetic reinforcement shall include full compensation for furnishing all labor and materials (including backfill material and geogrid materials), tools, equipment, and incidentals, and for doing all the work involved in placing the geosynthetic reinforcement layers, complete and in place, including splicing, overlapping and anchoring, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

Full compensation for adjusting drainage systems or other facilities made necessary by the use of an alternative geosynthetic embankment material shall be considered as included in the contract price paid per square meter for geosynthetic reinforcement and no adjustment in compensation will be made therefore.

#### **10-1.69 EMBANKMENT CONFINEMENT SYSTEM**

Embankment Confinement System shall consist of double twisted hexagonal PVC-coated steel wire mesh, zinc-coated square-grid wire mesh, reinforcing and shaping elements, fasteners, and erosion control (netting), including geosynthetic reinforcement. Individual components of Embankment Confinement System are as shown on the plans

and as indicated in the manufacturer's literature. Where there may be any discrepancies between the manufacturer's literature and these special provisions, these special provisions and the accompanying contract plans shall govern.

Geosynthetic reinforcement placing between layers of compacted fill for Embankment Confinement System at locations 1, 2, and 3 shall conform to the details shown on the plans and the requirement in "Geosynthetic Reinforcement Embankment," of these special provisions.

The embankment shall be constructed in vertical lifts with sections of Embankment Confinement System, and selected material, such that surface soil is adequately confined by the Embankment Confinement System and erosion control (netting), until vegetation is established. Embankment Confinement System shall be constructed as shown on the plans, as recommended by the manufacturer, in conformance with these special provisions, and as directed by the Engineer.

The overall width (embankment face, station-to-station), height, and length (embedment length in cross-sectional view) of the Embankment Confinement System shall vary no more than 5 percent from the dimensions that are shown on the plans.

## MATERIALS

A certificate of compliance for each shipment of double twisted hexagonal PVC-coated steel wire mesh, zinc-coated square-grid wire mesh, reinforcing and shaping elements, fasteners for Embankment Confinement System to the project site shall conform to the provision in Section 6-1.07, "Certificates of Compliance," of the Standard Specifications and shall be furnished to the Engineer.

A first certificate of compliance shall be furnished to the Engineer at least 2 weeks in advance of the time the Contractor begins construction of the Embankment Confinement System.

Major components of embankment confinement system shall be pre-packaged at the point of manufacture. Manufactured standard embedment panel lengths of the twisted hexagonal mesh shall match the dimensions shown on the plans, as closely as possible, such that trimming excess material is minimized. The manufactured, twisted hexagonal mesh shall be provided as continuous elements. The embedment panel length dimension shall not exceed the largest available standard manufactured length of 6 meters. The hexagonal mesh may be cut along the width dimension in the field to fit the required embedment length of each lift. Embedment length shall not be achieved splicing any additional pieces of mesh. Joining of adjacent sections of embankment confinement system is allowed and necessary to achieve the total width dimensions (station-to-station), as shown on the contract plans.

### Twisted Hexagonal Mesh and Selvage Wire

Mesh wires shall form a hexagonal pattern and shall be formed with a nonraveling twist. Nominal dimensions of the hexagonal mesh opening shall be 80 mm x 100 mm. The range for the smaller dimension shall be 75 mm to 85 mm, such that the area of the hexagonal opening does not exceed 6650 mm<sup>2</sup>.

Individual wires of the PVC-coated, twisted hexagonal mesh and selvage wires shall conform to the definitions and requirements in ASTM Designation A641/A641 M and ASTM A975-97 (Table 1, Mesh Characteristics for PVC-coated gabion), and also the following requirements:

#### MESH WIRE

Characteristic	Test Designation	Requirement
Minimum tensile strength	ASTM A370	410 MPa
Wire Size	USA Steel Wire Gage	12
Wire Diameter	ASTM A641/A641 M	2.69 mm
(Minimum)	ASTM A641/A641 M	2.59 mm
Galvanizing, Zinc	ASTM A641/A641 M, Class 3 and ASTM A90 / A90M	230 g/m <sup>2</sup>

#### SELVAGE WIRE

Characteristic	Test Designation	Requirement
Minimum tensile strength	ASTM A370	410 MPa
Wire Size	USA Steel Wire Gage	10
Wire Diameter	ASTM A641/A641 M	3.4 mm
(Minimum)	ASTM A641/A641 M	3.33 mm
Galvanizing, Zinc	ASTM A641/A641 M, Class 3 and ASTM A90 / A90M	260 g/m <sup>2</sup>

### Joint Wire

Standard tie wire shall conform to the definitions and requirements in ASTM Designation A641/A641 M and shall also conform to the following requirements:

TIE WIRE		
Minimum Tensile Strength	ASTM A370	410 Mpa
Tie Wire		
Wire Size (Minimum)	USA Steel Wire Gage	13.5
Wire Diameter	ASTM A641/A641 M	2.19 mm
(Minimum)	ASTM A641/A641 M	2.09 mm
Zinc Coating	ASTM A641/A641 M, Class 3 and ASTM A90/A90 M	220 g/m <sup>2</sup>

### Alternative Fasteners, Interlocking or Overlapping

Alternative fasteners shall have the configurations, wire diameters, and other dimensions as shown on the Department Standard Plan D100B, "Alternative Gabion Joint Material Fasteners". Alternative fasteners shall conform to the definitions and requirements in ASTM Designation A313/A313 M for "Stainless Steel Spring Wire" and shall be Tensile Type 302, Class 1.

### Welded Wire

There shall be no bulging or buckling of the completed front face of the Embankment Confinement System. Welded wire panels shall be installed as shown on the plans and shall be made from MW51.6 wire, according to ASTM A82, diameter 8.10 mm, tensile strength 515 MPa. The rectangular mesh openings shall be 150 mm x 162 mm, as recommended by the manufacturer. The weld shear value shall be at least 12.44 kN according to ASTM A185.

### Wire Brackets and Reinforcing Elements

Wire brackets for obtaining the slope angle (cross-sectional view) of the front panel face of Embankment Confinement System and other reinforcing elements shall be as recommended by the manufacturer. The manufacturer shall provide the engineer with literature that documents the dimensions and material properties of the various brackets and reinforcing elements.

### Polyvinyl Chloride (PVC) Coating

External coating shall consist of a nonconductive material, primarily polyvinyl chloride (PVC). Mesh wires, standard tie wires, and selvage wires shall be coated with the PVC material, after zinc coating is applied in conformance with wire manufacturers specifications and procedures.

The PVC coating shall be sampled and evaluated by ASTM E 204 (Fourier Transformed Infrared Spectroscopy-FTIR) to obtain a spectral scan. The manufacturer of Embankment Confinement System shall submit PVC-coated wire samples from normal production. The spectral scan must closely match those of PVC products previously tested and on file at the Department Transportation Laboratory, 5900 Folsom Blvd., Sacramento, CA 95819.

The minimum thickness of PVC which covers the wire shall be 0.38-mm, measured radially at any cross-section transverse to the wire length.

The PVC coating shall be complete by visual inspection. There shall be no nicks, cuts, holidays or abraded areas in the PVC coating of the mesh. Minor cuts, nicks, and other minor imperfections due to manufacturing, will be permitted along selvage-wrapped edges of twisted mesh. PVC will not be required at the ends of mesh where it has been trimmed along wire or panel edges during the normal manufacturing process.

The color of the PVC shall be gray. PVC coating shall be resistant to degradation by ultraviolet (UV) radiation. A suitable, UV-resistant additive shall be blended with the PVC. The additive shall be identified on the Certificate of Compliance.

### Filter Fabric

Filter fabric for use with Embankment Confinement System shall conform to the provisions in Section 88, "Engineering Fabrics," of the Standard Specifications and these special provisions.

### Backfill Material

Backfill material for Embankment Confinement System shall be native material. The backfill material for Embankment Confinement System shall consist of material free from organic material and substantially free of shale

or other soft, poor durability particles; shall not contain slag aggregates or recycled materials, such as glass, shredded tires, Portland cement concrete rubble, asphaltic concrete rubble, or other unsuitable material as determined by the Engineer: and shall meet the following requirements:

Gradation Requirements		
Sieve size, mm	Percent Passing	California Test
37.5	100	202
19	75-100	202
4.75	20-75	202
0.42	0-60	202
0.075	0-15	202

Property Requirements		
Test	Requirements	California Test
Sand Equivalent	8 min	217
Plasticity Index	10 max	204
Minimum Resistivity	1500 ohm-cm min	643
Chlorides	500 ppm max	422
Sulfates	2000 ppm max	417
pH	5 to 9.0	643

Select material to be placed for the embankment confinement system shall be compacted to a relative compaction of not less than 90 percent.

Select material shall be placed and compacted simultaneously with the erection of facing panels. Placement and compaction shall be accomplished without distortion of the soil reinforcement or displacement of the facing panels or the gabion wall at location as shown on the plans.

Sheepfoot or grid type roller shall not be used for compacting material within the limits of the soil reinforcement. Hand-held or hand guided compacting equipment shall be used to compact material within one meter of the facing panels or the back of the gabion wall.

## INSTALLATION

Embankment Confinement System shall be installed as indicated in the manufacturer's literature, as specified in these special provisions, and as directed by the Engineer.

The Embankment Confinement System confinement system shall be filled with backfill material consisting of both select material and imported borrow divided by filter fabric as shown on the plans. Erosion control netting, specified elsewhere in these special provisions, shall be installed between the front panel face and welded wire panel on the inside of the confinement system prior to placing select material backfill as shown on the plans.

Adjacent sections of Embankment Confinement System shall be assembled individually and then joined before the backfill is placed.

## GRADING, EXCAVATION AND BACKFILL

Areas where Embankment Confinement System are to be placed shall be constructed to the lines and grades shown on the plans and as directed by the Engineer.

## CONSTRUCTION

Within the same lift, Embankment Confinement System shall be assembled individually as empty sections. Each section shall be manufactured with top, front, and embedment, properly spaced and secured, so that the panels can be folded into position at the construction site with no additional tying or fastening of any folded joints.

Empty Embankment Confinement System sections shall be set in place and the panels unfolded as recommended by the manufacturer. The empty adjacent sections shall be joined every 900 mm in the embedment length dimension, using either standard tie wire or alternative fasteners, either interlocking or overlapping. The 900 mm-spaced joints shall be formed similar to those shown on the Department Standard Plan D100B "Standard Tie Wire Detail" or "Alternative Gabion Joint Material fasteners", except as follows. For standard tie wire, there shall be a double half hitch, and simple spiraling (looping without locking) shall not be allowed. For alternative fasteners, there shall be one alternative fastener every 900 mm, and the alternative fastener shall enclose both of the selvage wires in a single pass.

All joints on the embankment face, including the sloped-back front edges of adjacent sections of Embankment Confinement System, and the top edge to bottom edge of the next higher lift, shall be as shown on Caltrans Standard

Plan D100B, "Standard Tie Wire Detail" or "Alternative Gabion Joint Material fasteners". The nominal spacing of standard tie wire shall be 100 mm, with alternating double and single half-hitches (locked loops). At the contractor's option, an alternative fastener (interlocking or overlapping) shall be placed in each mesh opening along the joint, such that there is a minimum of 10 alternative fasteners per meter. The NOTES on the Department Standard Plan D100B apply to all joints on the embankment face, except the phrase "Embankment Confinement System" replaces the word "gabion". The alternative fastener shall contain and secure all the wires along the joint. When an alternative fastener can not enclose all the wires along the joint, then standard tie wire shall be used.

The back edge of the top panel that is folded over does not have to be joined to the bottom of the next embedment panel.

Multi-layered sections of Embankment Confinement System shall be assembled such that the front face panels are aligned in a smooth-uniform slope face as shown on the plans.

### **ASSEMBLY OF TRANSITIONAL EMBANKMENT CONFINEMENT SYSTEM**

To match the geometry of the planned Embankment Confinement System configuration, or to meet specific conditions, panels shall be folded, cut, or retied as recommended by the manufacturer and as directed by the Engineer.

### **FILLING WITH BACKFILL MATERIAL**

Before backfilling each confinement system with backfill material, all kinks and folds in the wire fabric shall be straightened and all successive Embankment Confinement System sections shall be properly aligned.

#### **Erosion Control (Netting)**

Erosion control (netting) for Embankment Confinement System shall conform to "Erosion Control (Netting)" of these special provisions.

Erosion control netting shall be installed and secured on the inside of the top, front and embedment panels (portions) between the front panel face and welded wire panel, as shown on the plans, prior to backfilling the outer portion of the confinement system with select material. Select material shall be placed in the Embankment Confinement System and compacted to a relative compaction of not less than 90 percent. At the interface between select material and imported borrow, filter fabric shall be placed as shown on the plans. At the contractor's option and at no cost to the State, wire mesh may be installed and secured at this interface of backfill materials to provide stiffening during backfilling operations. The filter fabric may be attached to the mesh.

If the Engineer determines that there is excessive bulging or dimpling of the embankment front face panels, the unit shall be reconstructed at the Contractor's expense.

### **MEASUREMENT AND PAYMENT**

Embankment Confinement System will be measured by the cubic meter of embankment confinement system, including all backfill material, geocomposite drain, geosynthetic reinforcement, inclusion embedment, front, and top panels for each section.

The contract price paid per cubic meter for Embankment Confinement System shall include full compensation for furnishing all labor, materials (including geosynthetic reinforcement and excluding erosion control (netting)), tools, equipment, and incidentals, and for doing all the work involved in Embankment Confinement System, complete in place, including, twisted wire mesh inclusions, selected material, backfill material, geocomposite drain welded wire fabric panel, steel reinforcing rods, support brackets, stainless steel rings, and all handling, placing and compaction of selected material, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

### **10-1.70 EROSION CONTROL (SEQUENCING)**

Place erosion control treatments in the following sequence for each erosion control type identified:

#### **Erosion Control (Type 1)**

Erosion Control (Compost Blanket)

Fiber Rolls

Erosion Control (Type D) (Seed Type 1)

### **Erosion Control (Type 2)**

Erosion Control (Compost Blanket)  
Erosion Control (Netting)  
Fiber Rolls (Type 2)  
Erosion Control (Type D) (Seed Type 1)

### **Erosion Control (Type 3)**

Topsoil  
Erosion Control (Netting)  
Erosion Control (Wire Mesh Blanket)  
Fiber Rolls (Type 2)  
Erosion Control (Type D) (Seed Type 2)

### **Erosion Control (Type 4)**

Erosion Control (Netting)  
Topsoil  
Erosion Control (Type D) (Seed Type 2)

### **Erosion Control (Type 5)**

Erosion Control (Compost Blanket)  
Erosion Control (Netting)  
Erosion Control (Wire Mesh Blanket)  
Fiber Rolls (Type 2)  
Erosion Control (Type D) (Seed Type 1)

### **Erosion Control (Type 6)**

Erosion Control (Netting)  
Fiber Rolls (Type 2)  
Erosion Control (Type D) (Seed Type 1)

## **10-1.71 EROSION CONTROL (NETTING)**

Erosion control (netting) shall conform with the details as shown on the plans, as specified in these special provisions, and as directed by the Engineer.

Erosion control (netting) work shall consist of furnishing, installing, and maintaining erosion control (netting) in ditches or swales, on embankment slopes, excavation slopes and other locations as shown on the plans.

Following the installation of erosion control (netting), erosion control materials shall be applied onto the netting face as specified in "Erosion Control (Type D)," of these special provisions.

### **MATERIALS**

Materials for the erosion control (netting) shall conform to the provisions in Section 20-2, "Materials," of the Standard Specifications and these special provisions.

### **Erosion Control Netting**

Erosion control netting shall consist of 100 percent spun coir fiber and shall conform to the following:

Specification	Requirement
Weight, grams per square meter ASTM Designation: D 3776	400
Minimum Tensile Strength, kilonewtons, ASTM Designation: D 4595	9.0 to 11.3 kN/m in longitudinal direction (dry) 5.0 to 10.7 kN/m in cross-direction (dry) 6.0 to 9.8 kN/m in longitudinal direction (wet) 4.0 to 9.4 kN/m in cross- direction (wet)
Roll Width, meters, min.	4
Area/Roll, square meters, min.	200
Open Area, percent	63-70

### **Staples**

Staples shall be as shown on the plans.

### **INSTALLATION**

Erosion control (netting) shall be installed in ditches or swales, on embankment slopes, or excavation slopes as follows:

- A. Erosion control (netting) strips shall be placed loosely along the ditch or swale with the longitudinal edges and joints parallel to the centerline of the ditch or swale. Longitudinal joints of netting shall be overlapped and stapled. Transverse joints of netting shall be secured in intermediate joint trenches. Staples shall be driven perpendicular to the slopes. Ends of the netting shall be secured in place in key trenches.
- B. Erosion control (netting) strips shall be placed loosely on the embankment or excavation slope with the longitudinal joints perpendicular to the slope contour lines. Longitudinal and transverse joints of netting shall be overlapped and stapled. Staples shall be driven perpendicular to the slopes. Ends of the netting shall be secured in place in key trenches.

### **MAINTENANCE**

Damaged netting shall be replaced on the same day the damage occurs. Washouts between joints or beneath the netting shall be repaired on the same day damaged occurs. Erosion control (netting) damaged by the Contractor's vehicles, equipment, or operations shall be replaced or repaired by the Contractor at the Contractor's expense.

### **MEASUREMENT AND PAYMENT**

The quantity of erosion control (netting) will be measured by the square meter as determined from actual slope measurements of the areas covered by the erosion control (netting) excluding overlaps.

The contract price paid per square meter for erosion control (netting) shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in installing erosion control (netting), complete in place, including trench excavation and backfill, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

### **10-1.72 EROSION CONTROL (WIRE MESH BLANKET)**

#### **GENERAL**

##### **Summary**

This work includes installing erosion control (wire mesh blanket).

##### **Submittals**

Submit a Certificate of Compliance under Section 6-1.07, "Certificates of Compliance" of the Standard Specifications for:

1. Wire mesh
2. Fasteners

## MATERIALS

### Wire Mesh

Wire mesh must be 12 gage twisted mesh , as shown on the plans, and in conformance with Table A herein. Individual wires of the twisted-mesh shall conform to the definitions and requirements in ASTM Designation: A 641/A 641M. The individual wires shall have a polyvinyl chloride (PVC) coating.

**Table A**

MESH MATERIAL PROPERTIES		
Characteristic	Test Designation	Requirement
Minimum tensile strength	ASTM A 370	413 Mpa
Wire Size	USA Steel Wire Gage	12
Wire Diameter	ASTM A 641/A 641M	2.69 mm
(Minimum)	ASTM A 641/A 641M	2.59 mm
Galvanizing, Zinc	ASTM A 641/A 641M, Class 3 and ASTM A90/A90M	228 g/m <sup>2</sup>
Wire Size	USA Steel Wire Gage	11
Wire Diameter	ASTM A 641/A 641M	3.04 mm
(Minimum)	ASTM A 641/A 641M	2.94 mm
Galvanizing, Zinc	ASTM A 641/A 641M, Class 3 and ASTM A 90/A 90M	244 g/m <sup>2</sup>
Wire Size	USA Steel Wire Gage	9
Wire Diameter (Minimum)	ASTM A 641/ A641M	3.75 mm
Galvanizing, Zinc	ASTM A 641/A 641M	3.65 mm
	ASTM A 641/A 641M, Class 3 and ASTM A 90/A 90M	259 g/m <sup>2</sup>

Twisted-mesh wires shall form a uniform hexagonal pattern and shall be formed with a nonraveling twist. The area of the hexagonal opening shall not exceed 262 mm. Twisted-mesh panels shall be manufactured from 12 gage wires with 10 gage selvage wires.

### Polyvinyl Chloride (PVC) Coating

External coating shall consist of a nonconductive material, primarily polyvinyl chloride (PVC). Mesh wire, standard tie wires, standard spiral binders, internal connecting wires, preformed stiffeners, and selvage wire shall be coated with the PVC material after the zinc coating is applied in conformance with the manufacturer's specifications.

The PVC coating shall be evaluated by infrared spectral scan. The scan must closely match those of tested known acceptable products already on file at the Transportation Laboratory.

The minimum thickness of PVC which covers the wire shall be 0.38 mm, measured radially at any cross-section transverse to the wire length.

The PVC coating shall be complete by visual inspection. There shall be no nicks, cuts, holidays or abraded areas in the PVC coating of the mesh. Minor cuts, nicks, and other minor imperfections due to manufacturing, will be permitted along selvage-wrapped edges of twisted mesh. PVC will not be required to coat the ends of either style of mesh where the PVC has been trimmed along wire or panel edges during the normal manufacturing process.

PVC coating shall be resistant to degradation by ultraviolet (UV) radiation. A suitable, UV-resistant additive shall be blended with the PVC. This additive shall be identified on the Certificate of Compliance.

The color of the PVC shall be brown. The color shall be resistant to fading when exposed to natural sunlight.



### **Tie Wire**

Standard tie wire shall conform to the definitions and requirements in ASTM Designation: A 641/A 641M and shall conform to the following provisions:

Characteristic	Test Designation	Requirement
Minimum Tensile Strength	ASTM A 370	413 Mpa
Tie Wire		
Wire Size (Minimum)	USA Steel Wire Gage	13.5
Wire Diameter (Minimum)	ASTM A 641/ A641M	2.18 mm2.08 mm213
Zinc Coating	ASTM A 641/A 641M	g/m2
	ASTM A 641/A 641M, Class 3 and ASTM A 90/A 90M	

Alternative fasteners shall have the configurations, wire diameters, and other dimensions shown on the plans. Alternative fasteners shall conform to the definitions and requirements in ASTM Designation: A 313/A 313M for "Stainless Steel Spring Wire" and shall be Tensile Type 302, Class 1.

### **Cable**

Cable must comply with the following:

1. Cable must be commercial quality galvanized steel wire rope with a minimum diameter of 12 mm and a minimum breaking strength of at least 3,407 kgs. Cable must be galvanized with Class A galvanizing conforming to the requirements in ASTM A 603.
2. Splices and end connections of wire rope must be made with metal clips or clamps.
3. Cable clamps and other required fittings shall be commercial quality steel, malleable iron, or wrought iron.
4. Hardware, nuts and bolts, turnbuckles, U-bolts, cable clamps, and other fittings must comply with the provisions in Section 75-1.05, "Galvanizing," of the Standard Specifications.

### **Fasteners**

Fasteners must be slope anchors consisting of a soil anchor, anchor rod, anchor plate and attachment hardware.

Soil anchors must be hot dipped galvanized, ductile iron, with an ultimate holding strength of 13 kN, and comply with ASTM A-123. The anchor head must pivot once embedded into the ground. The pivoting action below ground while the anchor is being set achieves holding capacity and pull out resistance.

Anchor rods must be threaded, steel rod with a minimum diameter of 9.5 mm. Provide enough length to satisfy the specified minimum finished embedment length as shown on the plans.

Anchor plates must be steel plate treated with a corrosion resistant coating. The center of the anchor plate shall be drilled with a hole sufficient to accommodate the diameter of the anchor rod. Chamfer plate corners 25 mm and bend inwards as shown on the plans.

Anchor rods and attachment hardware such as washers, bolts, nuts, etc., must be hot dip galvanized under ASTM A 153.

### **Grout**

Grout shall conform to the provisions in Section 50-1.09, "Bonding and Grouting" of the Standard Specifications. California Test 541 will not be required nor will the grout be required to pass through the screen with a 1.8 mm maximum clear opening prior to being introduced into the grout pump.

Fine aggregate may be added to the grout mixture of portland cement and water drilled in holes 150 mm in diameter or greater, but only to the extent that the cement content of the grout is not less than 502 kilograms per cubic meter of grout. Fine aggregate, if used, shall conform to the provisions in Section 90-2 "Materials" and section 90-3, "Aggregate Gradings," of the Standard Specifications.

## **CONSTRUCTION**

### **Site Preparation**

Immediately prior to placing erosion control (wire mesh blanket), remove trash, debris and weeds.

Removed trash, debris and weeds must be disposed of in conformance with the provisions in Section 7-1.13, "Disposal of Material Outside the Highway Right of Way," of the Standard Specifications.

Temporary slope ladders may be required during installation to prevent sloughing of material.

## **Installation**

Place erosion control (wire mesh blanket) over the rolled erosion control product (netting) with edges perpendicular to the slope contour lines and staggered between sections of the netting as shown on the plans. Overlap edge of wire mesh panel a minimum of 100 mm and fasten together with tie wires. Secure wire mesh to the slope with fasteners as shown on the plans.

Press and mold wire mesh so it conforms with, and flush to the slope face. Some gaps between panels may be necessary due to irregular slope surfaces. Fill gaps with additional wire mesh fitted to provide the specified overlap requirement.

Tie wires for twisted mesh, the joints shall be constructed using alternating double and single half hitches (locked loops) of 13.5-gage standard tie wire at 25 mm nominal spacing. Joints shall not be constructed with simple spiraling (looping without locking) of the standard tie wires.

When standard tie wire is used as a joint connector for welded mesh, the joint shall be constructed using alternating double and single half hitches (locked loops) in every mesh opening along the joint. When 9 gage spiral binders are used, the spiral shall be placed so that the spiral binder passes through each mesh opening along the joint. Both ends of all 9 gage spiral binders shall be crimped to secure the spiral in place.

Temporary fasteners may be used to hold wire mesh panels wherever joints will be constructed. Temporary fasteners may remain in place.

At the Contractor's option, interlocking fasteners or overlapping fasteners may be used for assembly of joints for twisted-mesh blanket. A fastener shall be placed in each mesh opening along the joint (a minimum of 1 fasteners per 127 mm).

Install slope anchors along the overlap edge of the wire mesh as shown on the plans and as instructed by the soil anchor manufacturer. Slope anchors may be installed at closer intervals to conform with changes in topography.

Soil anchors must be driven to a depth that allows sufficient pull back allowance to meet the required minimum embedment length after proof testing. After the anchor has been driven into the soil past its maximum embedment depth, the anchor rod shall be drawn back at least 100 mm or when a torque of 2.0 Nm is achieved, to ensure that the soil anchor has reached full pivot. A torque wrench may be required to verify pull out resistance.

Drilled holes for anchor rods installed in rock shall be a minimum of two times the diameter of the anchor rod and filled with grout prior to insertion of the rod. The length of the drilled hole shall be long enough to accept the full length of the anchor rod including 50 mm clearance. All anchor rods installed in drilled holes shall have at least 2 centralizers equally spaced to adequately support and center the rod in the drilled hole.

Install cable restraint over the wire mesh and secured at each slope anchor as shown on the plans.

Thread cable through the top and bottom perimeter edge of wire mesh and secure at each slope anchor as shown on the plans.

Fold perimeter edge of the wire mesh over the perimeter restraint and fasten as shown on the plans.

Following the installation of erosion control (wire mesh blanket), apply erosion control (Type D) as shown on the plans and in accordance with "Erosion Control (Type D)," of these special provisions.

## **Testing**

Randomly proof test installed slope anchors over the wire mesh area to verify adequate pull out strength as instructed by the soil anchor manufacturer. A minimum of 45 slope anchors must be tested.

If any slope anchor fails the proof test, notify the Engineer within 24 hours to determine corrective measures.

## **MEASUREMENT AND PAYMENT**

The quantity of erosion control (wire mesh blanket) will be determined by the square meter from actual measurement of the area covered by the wire mesh excluding overlapped portions.

The contract price paid per square meter for erosion control (wire mesh blanket) shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in installing and securing wire mesh blanket, complete in place, including furnishing temporary slope ladders and performing proof tests for slope anchors, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

### **10-1.73 MOVE-IN/MOVE-OUT (EROSION CONTROL)**

Move-in/move-out (erosion control) shall include moving onto the project when an area is ready to receive erosion control as determined by the Engineer, setting up all required personnel and equipment for the application of erosion control materials and moving out all personnel and equipment when erosion control in that area is completed.

When areas are ready to receive applications of erosion control (Types D), as determined by the Engineer, the Contractor shall begin erosion control work in that area within 5 working days of the Engineer's notification to perform the erosion control work.

Attention is directed to the requirements of erosion control (Types D) elsewhere in these special provisions.

Quantities of move-in/move-out (erosion control) will be determined as units from actual count as determined by the Engineer. For measurement purposes, a move-in followed by a move-out will be considered as one unit.

The contract unit price paid for move-in/move-out (erosion control) shall include full compensation for furnishing all labor, materials (excluding erosion control materials), tools, equipment, and incidentals and for doing all the work involved in moving in and removing from the project all personnel and equipment necessary for application of erosion control (Types D), as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

No adjustment of compensation will be made for any increase or decrease in the quantities of move-in/move-out (erosion control) required, regardless of the reason for the increase or decrease. The provisions in Section 4-1.03B, "Increased or Decreased Quantities," of the Standard Specifications shall not apply to the item of move-in/move-out (erosion control).

#### **10-1.74 EROSION CONTROL (TYPE D)**

Erosion control (Type D) includes applying erosion control materials to embankment and excavation slopes and other areas disturbed by construction activities. Erosion control (Type D) must comply with Section 20-3, "Erosion Control," of the Standard Specifications and these special provisions.

Apply erosion control (Type D) when an area is ready to receive erosion control as determined by the Engineer and under "Move-in/Move-out (Erosion Control)" of these special provisions.

Before applying erosion control materials, prepare soil surface under Section 19-2.05, "Slopes," of the Standard Specifications, except that rills and gullies exceeding 50 mm in depth or width must be leveled. Remove vegetative growth, temporary erosion control materials, and other debris from areas to receive erosion control.

Before applying erosion control materials, the Engineer designates the ground location of erosion control (Type D) in increments of one hectare or smaller for smaller areas. Place stakes or other suitable markers at the locations designated by the Engineer. Furnish all tools, labor and materials required to adequately indicate the various locations.

#### **MATERIALS**

Materials must comply with Section 20-2, "Materials," of the Standard Specifications and these special provisions.

##### **Seed**

Seed must comply with Section 20-2.10, "Seed," of the Standard Specifications. Seed not required to be labeled under the California Food and Agricultural Code shall be tested for purity and germination by a seed laboratory certified by the Association of Official Seed Analysts or by a seed technologist certified by the Society of Commercial Seed Technologists. Measure and mix individual seed species in the presence of the Engineer.

Seed must contain at most 1.0 percent total weed seed by weight.

Deliver seed to the job site in unopened separate containers with the seed tag attached. Containers without a seed tag attached are not accepted. The Engineer takes a sample of approximately 30 g or 60 ml of seed for each seed lot greater than 1 kg.

Seed must comply with the following:

## Seed (Type 1)

Botanical Name (Common Name)	Percent Germination (Minimum)	Kilograms Pure Live Seed Per Hectare (Slope Measurement)
<i>Bromus carinatus</i> * (California Brome)	40	8.0
<i>Elymus glaucus</i> * (Blue Wild Rye)	40	8.0
<i>Eschscholzia californica</i> (California poppy)	35	2.0
<i>Festuca idahoensis</i> * (Idaho fescue)	35	8.0
<i>Hordeum brachyantherum</i> (Meadow Barley)	40	6.0
<i>Lupinus nanus</i> (Sky Lupine)	40	3.0
<i>Nassella cernua</i> (Nodding Needlegrass)	35	8.0
<i>Nassella pulchra</i> (Purple Needlegrass)	35	12.0
<i>Poa secunda</i> * (Native Pine Bluegrass)	30	4.0
<i>Trifolium tridentatum</i> (Tomcat Clover)	50	5.0
<i>Vulpia microstachys</i> (Three Weeks Fescue)	45	6.0

\*Seed produced in California only.

## Seed (Type 2)

Botanical Name (Common Name)	Percent Germination (Minimum)	Kilograms Pure Live Seed Per Hectare (Slope Measurement)
<i>Achillea millefolium</i> (White Yarrow)	40	1.0
<i>Artemisia californicum</i> (California Sagebrush)	25	1.5
<i>Baccharis pilularis</i> (Coyote Bush)	15	0.2
<i>Bromus carinatus</i> * (California Brome)	40	8.0
<i>Elymus glaucus</i> * (Blue Wild Rye)	40	12.0
<i>Festuca idahoensis</i> * (Idaho fescue)	35	8.0
<i>Heteromoles arbutifolia</i> (Toyon)	30	3.0
<i>Iris douglasiana</i> (Douglas Iris)	30	1.5
<i>Rhamnus californica</i> (Coffeeberry)	35	1.5
<i>Salvia mellifera</i> (Black Sage)	30	4.0
<i>Trifolium tridentatum</i> (Tomcat Clover)	50	5.0
<i>Vulpia microstachys</i> (Three Weeks Fescue)	45	8.0

\*Seed produced in California only.

### Seed Sampling Supplies

At the time of seed sampling, provide the Engineer a glassine lined bag and custody seal tag for each seed lot sample.

### Commercial Fertilizer

Commercial fertilizer must comply with Section 20-2.02, "Commercial Fertilizer," of the Standard Specifications and have a guaranteed chemical analysis within 2 percent of 7 percent nitrogen, 2 percent phosphoric acid and 3 percent water soluble potash.

### Straw

Straw must comply with Section 20-2.06, "Straw," of the Standard Specifications and these special provisions.

Straw must be derived from rice.

Straw must be free of plastic, glass, metal, rocks, and refuse or other deleterious material.

### Stabilizing Emulsion

Stabilizing emulsion must comply with Section 20-2.11, "Stabilizing Emulsion," of the Standard Specifications and these special provisions.

Stabilizing emulsion:

1. Must be in a dry powder form
2. Must be a processed organic adhesive used as a soil tackifier
3. May be reemulsifiable

### APPLICATION

Apply erosion control materials in separate applications in the following sequence:

1. Apply the following mixture with hydroseeding equipment at the rates indicated within 60 minutes after the seed has been added to the mixture:

Seed (Type 1)

Material	Kilograms Per Hectare (Slope Measurement)
Seed	70
Fiber	1,960
Commercial Fertilizer	675

Seed (Type 2)

Material	Kilograms Per Hectare (Slope Measurement)
Seed	53.7
Fiber	1,960
Commercial Fertilizer	675

2. Apply straw at the rate of 3.5 tonnes per hectare based on slope measurements. Incorporation of straw will not be required. Distribute straw evenly without clumping or piling. Straw is only required in erosion control (Type 1) areas.
3. Apply the following mixture with hydro-seeding equipment at the corresponding rates:

Both Seed Types

Material	Kilograms Per Hectare (Slope Measurement)
Fiber	1,960
Stabilizing Emulsion (Solids)	225

The ratio of total water to total stabilizing emulsion in the mixture must be as recommended by the manufacturer.

Hydraulic application of materials for erosion control (netting) areas shall be applied by hose, from the ground. Erosion control (Type D) materials shall be applied onto the slope face such that the materials are well integrated into the erosion control (netting) and in contact with ground surface. Application shall be perpendicular to the slope face such that erosion control (netting) materials are not damaged or displaced. Erosion control (netting) damaged by the Contractor's operations shall be replaced by the Contractor at the Contractor's expense.

Once straw work is started in an area, complete stabilizing emulsion applications in that area on the same working day.

The Engineer may change the rates of erosion control materials to meet field conditions.

## **MEASUREMENT AND PAYMENT**

Erosion control (Type D) will be measured by the square meter or by the hectare, whichever is designated in the Engineer's Estimate. The area will be calculated on the basis of actual or computed slope measurements.

The contract price paid per square meter or hectare for erosion control (Type D) includes full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in applying erosion control (Type D) complete in place, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

### **10-1.75 EROSION CONTROL (COMPOST BLANKET)**

Erosion control (Compost Blanket) includes furnishing and applying erosion control (Compost Blanket) materials to embankment and excavation slopes and areas disturbed by construction activities as shown on the plans. Erosion control (Compost Blanket) must comply with Section 20-3, "Erosion Control," of the Standard Specifications and these special provisions.

Apply erosion control (Compost Blanket) when an area is ready to receive erosion control as determined by the Engineer and under "Move-In/Move-Out (Erosion Control)" of these special provisions.

Before applying erosion control materials, the Engineer designates the ground location of erosion control (Compost Blanket) in increments of one hectare or smaller for smaller areas. Place stakes or other suitable markers at the locations designated by the Engineer. Furnish all tools, labor and materials required to adequately indicate the various locations.

## **MATERIALS**

Materials must comply with Section 20-2, "Materials," of the Standard Specifications and these special provisions.

### **Compost**

The compost producer must be fully permitted as specified under the California Integrated Waste Management Board, Local Enforcement Agencies and any other State and Local Agencies that regulate Solid Waste Facilities. If exempt from State permitting requirements, the composting facility must certify that it follows guidelines and procedures for production of compost meeting the environmental health standards of Title 14, California Code of Regulations, Division 7, Chapter 3.1, Article 7.

The compost producer must be a participant in United States Composting Council's Seal of Testing Assurance program.

Compost may be derived from any single, or mixture of the following feedstock materials:

1. Green material consisting of chipped, shredded, or ground vegetation; or clean processed recycled wood products
2. Biosolids
3. Manure
4. Mixed food waste

Compost feedstock materials to reduce weed seeds, pathogens and deleterious materials as specified under Title 14, California Code of Regulations, Division 7, Chapter 3.1, Article 7, Section 17868.3.

Compost must not be derived from mixed municipal solid waste and must be reasonably free of visible contaminants. Compost must not contain paint, petroleum products, pesticides or any other chemical residues harmful to animal life or plant growth. Compost must not possess objectionable odors.

Metal concentrations in compost must not exceed the maximum metal concentrations listed under Title 14, California Code of Regulations, Division 7, Chapter 3.1, Section 17868.2.

Compost must comply with the following:

Physical/Chemical Requirements		
Property	Test Method	Requirement
pH	*TMECC 04.11-A Elastometric pH 1:5 Slurry Method pH Units	6.0–8.0
Soluble Salts	TMECC 04.10-A Electrical Conductivity 1:5 Slurry Method dS/m (mmhos/cm)	0-10.0
Moisture Content	TMECC 03.09-A Total Solids & Moisture at 70+/- 5 deg C % Wet Weight Basis	30-60
Organic Matter Content	TMECC 05.07-A Loss-On-Ignition Organic Matter Method (LOI) % Dry Weight Basis	30–65
Maturity	TMECC 05.05-A Germination and Vigor Seed Emergence Seedling Vigor % Relative to Positive Control	80 or Above 80 or Above
Stability	TMECC 05.08-B Carbon Dioxide Evolution Rate mg CO <sub>2</sub> -C/g OM per day	8 or below
Particle Size	TMECC 02.02-B Sample Sieving for Aggregate Size Classification % Dry Weight Basis	100% Passing 75 mm 90-100% Passing 25 mm 65-100% Passing 19mm 0 - 75% Passing 6mm  Maximum length 150 mm
Pathogen	TMECC 07.01-B Fecal Coliform Bacteria < 1000 MPN/gram dry wt.	Pass
Pathogen	TMECC 07.01-B Salmonella < 3 MPN/4 grams dry wt.	Pass
Physical Contaminants	TMECC 02.02-C Man Made Inert Removal and Classification: Plastic, Glass and Metal % > 4mm fraction	Combined Total: < 1.0
Physical Contaminants	TMECC 02.02-C Man Made Inert Removal and Classification: Sharps (Sewing needles, straight pins and hypodermic needles) % > 4mm fraction	None Detected

\*TMECC refers to "Test Methods for the Examination of Composting and Compost," published by the United States Department of Agriculture and the United States Compost Council (USCC).

Before compost application, provide the Engineer with a copy of the compost producer's compost technical data sheet and a copy of the compost producers Seal of Testing Assurance certification.

The compost technical data sheet must include:

1. Laboratory analytical test results
2. Directions for product use
3. List of product ingredients.

Before compost application, provide the Engineer with a Certificate of Compliance under Section 6-1.07, "Certificates of Compliance," of the Standard Specifications.

## **APPLICATION**

Before application of compost, prepare soil surface under Section 19-2.05, "Slopes," of the Standard Specifications. Remove vegetative growth, temporary erosion control materials, and other debris from areas to receive erosion control (Compost Blanket).

Apply compost uniformly to a thickness of 25 millimeters.

Erosion control (Compost Blanket) must extend to the edge of retaining sidewalks, walls, curbs, dikes, paving, and to within 1.2 meters from the flow line of paved and unpaved drainage ditches.

## **MEASUREMENT AND PAYMENT**

Erosion Control (Compost Blanket) will be measured by the cubic meter of compost in the vehicle at the point of delivery in conformance with the provisions in Section 9-1.01, "Measurement of Quantities," of the Standard Specifications.

The contract price paid per cubic meter for erosion control (Compost Blanket) includes full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in applying erosion control (Compost Blanket), as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

## **10-1.76 FIBER ROLLS**

Fiber rolls shall be furnished and installed in conformance with details shown on the plans and these special provisions and as directed by the Engineer.

Fiber rolls shall be installed on excavation and embankment slopes and other disturbed soil areas.

At the option of the Contractor, fiber rolls shall be Type 1 or Type 2.

## **MATERIALS**

### **Fiber Roll**

Fiber roll shall be either:

1. Constructed with a premanufactured blanket consisting of either wood excelsior, rice or wheat straw, or coconut fibers or a combination of these materials. The blanket shall be between 2.0 m and 2.4 m in width and between 20 m and 29 m in length. Wood excelsior shall be individual fibers, of which 80 percent shall be 150 mm or longer in length. The blanket shall have a biodegradable jute, sisal, or coir fiber netting. The blanket shall be rolled along the width and secured with jute twine spaced 2 m apart along the full length of the roll and placed 150 mm from the ends of each roll. The finished roll shall be between 200 mm and 250 mm in diameter, a minimum of 6 m in length, and shall weigh at least 0.81-kg/m. More than one blanket may be required to achieve the finished roll diameter. When more than one blanket is required, blankets shall be jointed longitudinally with an overlap of 150 mm along the length of the blanket.
2. A premanufactured roll of rice or wheat straw, wood excelsior, or coconut fiber encapsulated within a biodegradable jute, sisal, or coir fiber netting. The netting shall have a minimum durability of one year after installation. The netting shall be secured tightly at each end of the roll. Rolls shall be between 200 mm and 300 mm in diameter. Rolls between 200 mm and 250 mm in diameter shall have a minimum weight of 1.6 kg/m and a minimum length of 6 m. Rolls between 250 mm and 300 mm in diameter shall have a minimum weight of 4.5 kg/m and a minimum length of 3 m.

### **Stakes**

Wood stakes shall be a minimum of 19 mm x 19 mm x 450 mm in size for Type 1 installation, or a minimum of 19 mm x 38 mm x 450 mm in size for Type 2 installation. Wood stakes shall be untreated fir, redwood, cedar, or pine and cut from sound timber. They shall be straight and free of loose or unsound knots and other defects which would render them unfit for the purpose intended. Metal stakes shall not be used.

### **Rope**

Rope shall be biodegradable, such as sisal or manila, with a minimum diameter of 6.35 mm.



## **INSTALLATION**

Fiber rolls shall be installed as follows:

1. Fiber rolls (Type 1): Furrows shall be constructed to a depth between 50 mm and 100 mm, and to a sufficient width to hold the fiber roll. Stakes shall be installed 600 mm apart along the length of the fiber rolls and stopped at 300 mm from each end of the rolls. Stakes shall be driven to a maximum of 50 mm above, or flush with the top of the roll.
2. Fiber rolls (Type 2): Rope and notched stakes shall be used to restrain the fiber rolls against the slope. Stakes shall be driven into the slope until the notch is even with the top of the fiber roll. Rope shall be knotted at each stake and laced between stakes. After installation of the rope, stakes shall be driven into the slope such that the rope will hold the fiber roll tightly to the slope. Furrows will not be required.
3. Fiber rolls shall be placed as shown on plans.
4. The bedding area for the fiber rolls shall be cleared of obstructions including rocks, clods, and debris greater than 25 mm in diameter before installation.
5. Fiber rolls shall be installed approximately parallel to the slope contour.
6. Fiber rolls shall be installed before the application of other erosion control or soil stabilization materials in the same area.

If the intended function of the fiber rolls to disperse concentrated water runoff and to reduce runoff velocities is impaired, the Contractor shall take action to repair or replace the fiber rolls. Split, torn, or unraveling rolls shall be repaired or replaced. Broken or split stakes shall be replaced. Sagging or slumping fiber rolls shall be repaired with additional stakes or replaced. Locations where rills and other evidence of concentrated runoff have occurred beneath the rolls shall be corrected. Fiber rolls shall be repaired or replaced within 24 hours of identifying the deficiency.

## **MEASUREMENT AND PAYMENT**

Quantities of fiber rolls to be paid for will be determined by the meter measured along the centerline of the installed roll. Where fiber rolls are joined and overlapped, the overlap will be measured as a single installed roll.

The contract price paid per meter for fiber roll shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in installing fiber rolls, complete in place, including furrow excavation and backfill, repairing or replacing fiber rolls as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

Damage to fiber rolls resulting from the Contractor's vehicles, equipment, or operations shall be repaired at the Contractor's expense.

### **10-1.77 TOPSOIL**

Topsoil shall be obtained from sources within the project as shown on the plans and in conformance with the provisions in Section 19-2.07, "Selected Material," and Section 20-2.01, "Topsoil," of the Standard Specifications and these special provisions. Topsoil work shall consist of excavating, windrowing or stockpiling, removing from windrows or stockpiles, spreading, and compacting topsoil as shown on the plans or as designated by the Engineer.

Attention is directed to "Clearing and Grubbing" of these special provisions regarding the clearing of vegetation. Excavating topsoil shall not be performed in an area until clearing and grubbing has been completed in that area.

Topsoil shall be obtained by excavating the top 150 mm of material from proposed excavation and embankment areas and other areas shown on the plans or designated by the Engineer. Topsoil shall be stockpiled adjacent to the top of proposed excavation slopes and adjacent to the toe of proposed embankment slopes. When topsoil cannot be stockpiled adjacent to the slope lines as specified herein, excavated topsoil may be stockpiled at other locations when approved in writing by the Engineer. Rocks and plant material in excess of 25 mm in greatest dimension shall be removed from the excavated topsoil.

Upon completion of the grading operations for the excavation and embankment slopes and other areas to receive topsoil, the topsoil shall be spread to a uniform depth of not less than 750 mm and compacted or stabilized in a manner that retains the material in place on the slopes. The topsoil shall not be compacted or stabilized to the degree that the topsoil is not maintained as a viable growing medium.

Attention is directed to "Erosion Control" of these special provisions regarding the application of erosion control materials. Topsoil shall be placed on the designated areas before erosion control materials are applied or during installation of embankment confinement system as specified in "Embankment Confinement System," of these special provisions.

### **10-1.78 IRRIGATION CROSSOVERS**

Irrigation crossovers shall conform to the provisions in Section 20-5, "Irrigation Systems," of the Standard Specifications and these special provisions.

Conduits shall be placed in open trenches in conformance with the provisions in Section 20-5.03B, "Conduit for Irrigation Crossovers," of the Standard Specifications.

Conduits shall be corrugated high density polyethylene (CHDPE) pipe. Corrugated high density polyethylene pipe shall conform to the requirements in ASTM Designation: F 405 or F 667, or AASHTO Designation: M 252 or M 294 and shall be Type S. Couplings and fittings shall be as recommended by the pipe manufacturer.

Water line crossovers shall conform to the provisions in Section 20-5.03C, "Water Line Crossovers," of the Standard Specifications.

Sprinkler control crossovers shall conform to the provisions in Section 20-5.027D, "Sprinkler Control Crossovers," of the Standard Specifications.

Installation of pull boxes shall conform to the provisions in Section 20-5.027I, "Conductors, Electrical Conduit and Pull Boxes," of the Standard Specifications. When no conductors are installed in electrical conduits, pull boxes for irrigation crossovers shall be installed on a foundation of compacted soil.

### **10-1.79 IRRIGATION SLEEVE**

Irrigation sleeves shall be polyvinyl chloride (PVC) plastic pipe and shall conform to the provisions in Section 20-2.15B(1), "Plastic Pipe Supply Line," of the Standard Specifications and these special provisions.

Irrigation sleeves less than 150 mm in diameter shall have a pressure rating (PR) 315.

Irrigation sleeves 150 mm or larger in diameter shall be Schedule 40.

Fittings shall be Schedule 40.

Irrigation sleeves shall be installed where shown on the plans.

Irrigation sleeves shall be installed not less than 0.45-m below finished grade measured to the top of the sleeve. Sleeves shall extend 150 mm beyond paving. The ends of the sleeve shall be capped until use.

Quantities of irrigation sleeve to be paid for will be determined from the slope length designated by the Engineer. Irrigation sleeve placed in excess of the lengths designated will not be paid for.

The contract price paid per meter for irrigation sleeve shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in irrigation sleeve, complete in place, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

### **10-1.80 TRANSPLANT PALM TREES**

Transplanting palm trees shall conform to the provisions in Section 20-4, "Highway Planting," of the Standard Specifications and these special provisions.

Palm trees to be transplanted shall be removed and either stored or transplanted at the new locations prior to performing other work within the location of the palm trees.

When the palm trees are removed and the work within the areas to which the trees are to be transplanted is not completed to the stage at which the trees can be planted, the trees shall be stored and maintained until transplanting can be completed. In other cases, the palm trees shall be planted at the new locations the same day the palm trees are removed.

Transplanting palm trees shall be performed between March 15 and October 15 unless otherwise directed by the Engineer.

Before each palm tree is planted, dead fronds and frond stubs shall be removed from the trunk. In addition, green fronds shall be removed up to 2 rows of fronds away from the center growth. The 2 remaining rows of fronds shall be tied in an upright position with light hemp or manila rope. Fronds and frond stubs for Phoenix dactylifera (Date Palm) shall be removed approximately 4 inches from the trunk. Other fronds and frond stubs shall be removed at the trunk in a manner that will not injure the tree trunk.

The roots of each palm tree or clump of palm trees shall be balled in a manner approved by the Engineer. Approval shall be obtained before removing any palm tree to be transplanted. The diameter and depth of each root ball shall be a minimum of 200 mm larger than the trunk diameter at the ground line. Exposed root balls shall be kept covered with wet burlap or canvas until the trees are planted.

Holes resulting from the removal of transplanted palm trees shall be backfilled the same day the trees are removed. Soil from the surrounding area may be used to backfill the holes. The backfill shall be mounded slightly above the surrounding ground level.

Palm trees shall not be dragged during transplanting operations and the trunks shall be protected from injury.

Each planting hole shall conform to the details shown on the plans.

Commercial fertilizer (slow release) for palm trees shall be a pelleted form, slow or controlled release with a nutrient release over an 6 to 12-month period, and shall fall within the following guaranteed chemical analysis range:

Ingredient	Percentage
Nitrogen	
Water Soluble Organic 0.92%	9
Water Insoluble Organic 8.08%	
Available Phosphoric Acid	3
Soluble Potash	
Soluble Potash 1.10%	9
Slowly Available Potash 7.9%	

Backfill material for the palm tree planting holes shall be plaster sand conforming to the following grading limits:

Sizing Requirements	
Sieve Sizes	Percent Passing
9.5-mm	100
4.75-mm	93-100
2.36-mm	61-66
1.18-mm	66-13
600-µm	35-12
300-µm	14-9
150-µm	11-15
75-µm	0-10

Before backfilling plant hole, place .0.6 cubic meter of drain rock at the base of the plant hole and over drain sump, as shown on the plans.

Commercial fertilizer (slow release) shall be mixed with backfill at the rate of 3 kilograms per cubic meter. Backfill material and fertilizer shall be thoroughly mixed and uniformly distributed in the hole without clods and lumps.

After the planting holes have been backfilled, water shall be applied to the full depth of the backfill soil.

Watering basins for the transplanted palm trees shall be constructed as shown on the plans.

When the palm trees are planted, a root stimulant, approved by the Engineer, shall be applied to the roots of each palm tree in conformance with the printed instructions of the root stimulant manufacturer. A copy of the printed instructions shall be furnished to the Engineer before applying a stimulant. Root stimulant to be used shall be submitted to the Engineer not less than 2 weeks prior to the stimulant's intended use. Root stimulants not approved by the Engineer shall not be used.

Palm trees to be transplanted shall be maintained by the Contractor from the time the palm trees are removed to the time of acceptance of the contract, provided however, that the contract will not be accepted unless the trees have been satisfactorily maintained for at least 180 working days after transplanting has been completed. The palm trees shall be watered as necessary to maintain the trees in a healthy condition. Dead fronds and frond stubs shall be removed from the trunk in a manner that will not injure the tree trunk. Trash, debris and weeds within the basins, including the basin walls, shall be removed and disposed of in conformance with the provisions in Section 7-1.13, "Disposal of Material Outside the Highway Right of Way," of the Standard Specifications. Weeds shall be removed before the weeds exceed 2 inches in length. Pesticides to be used for weed control shall be submitted to the Engineer not less than 2 weeks prior to the pesticide's intended use. Pesticides not approved by the Engineer shall not be used.

Transplanted palm tree shall be maintained with their vertical axis in a plumb condition. Any leaning or deviation from plumb shall be corrected without damage to the palm tree. Braces that are used to hold palm tree in an upright position shall be removed at least 60 days prior to the acceptance of the contract.

The provisions specified in Section 20-4.07, "Replacement," of the Standard Specifications for the replacement of unsuitable plants shall apply to transplanted palm trees. The replacement palm tree for each unsuitable transplanted palm tree shall be the same size and species as the palm tree being replaced. Each replacement palm tree shall be planted in the planting hole of the unsuitable palm tree which the new tree is replacing. The method for planting replacement palm trees shall be as specified in this section for transplanting palm trees. Removed

unsuitable transplanted palm trees shall be disposed of in conformance with the provisions in Section 7-1.13, "Disposal of Material Outside the Highway Right of Way," of the Standard Specifications.

The quantity of transplant palm trees will be measured by the unit as determined from actual count in place.

The contract unit price paid for transplant palm tree shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in transplanting palm trees, complete in place, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

#### 10-1.81 WATER METER

Water meters for the irrigation systems will be furnished and installed by the serving utility at the locations shown on the plans, and in conformance with the provisions in Section 20-5, "Irrigation Systems," of the Standard Specifications.

The Contractor shall make the arrangements and pay the costs and fees required by the serving utility.

The San Francisco Public Utilities Commission has established a fee of \$9,350 for furnishing and installing a 50 mm water meter. If, at the time of installation, this fee has been changed, the State will take a credit for the reduction in the fee, or the State will pay the difference for the increase in the fee. The credit or payment will be taken or paid on the first monthly progress payment made after the meter is installed. The Contractor shall furnish the Engineer with a copy of the invoice for the installation fee.

Attention is directed to Section 20-4.06, "Watering," of the Standard Specifications. The Contractor shall make the arrangements for furnishing and applying water until the water meters have been installed by the serving utility.

The quantity of water meters will be measured by the unit as determined from actual count in place.

The contract unit price paid for water meter shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in furnishing and installing water meters, complete in place, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

#### 10-1.82 AGGREGATE SUBBASE

Aggregate subbase must comply with Section 25, "Aggregate Subbases," of the Standard Specifications and these special provisions.

Aggregate subbase must be Class 4.

Do not store reclaimed asphalt concrete or aggregate subbase with reclaimed asphalt concrete within 30 m measured horizontally of any culvert, watercourse, or bridge.

Class 4 aggregate subbase must comply with:

Grading (Percentage Passing)		
Sieve Sizes	Operating Range	Contract Compliance
75-mm	100	100
63-mm	100	100
4.75-mm	30-65	25-70
75-µm	0-15	0-18

Quality		
Test	Operating Range	Contract Compliance
Sand Equivalent	21 Min.	18 Min.
Resistance (R-value)	----	50 Min.

If tests show grading or sand equivalent does not comply with the "Operating Range" specifications but complies with the "Contract Compliance" specifications, you may place aggregate subbase for the remainder of that day. Do not start another day's work until tests or other information indicate the next day's material complies with the "Operating Range" specifications.

If tests show grading or sand equivalent does not comply with the "Contract Compliance" specifications, remove the aggregate subbase represented by the tests. If you request and the Engineer approves, that aggregate subbase may remain in place and the Department reduces payment by \$3.00 per cubic meter for that aggregate subbase. If the subbase remains in place and both the grading and sand equivalent do not comply with "Contract Compliance" specifications, the Department only makes one payment reduction.

No single grading or sand equivalent test may represent more than the smaller of 400 m<sup>3</sup> or one day's production.

Instead of Class 4 aggregate subbase, you may place Class 2 aggregate subbase complying with the aggregate grading and quality requirements in Section 25-1.02A, "Class 1, Class 2, and Class 3 Aggregate Subbases," of the Standard Specifications. If you place Class 2 aggregate subbase, do not change back to Class 4 subbase without written approval from the Engineer.

Regardless of the aggregate subbase class supplied, the Department pays for aggregate subbase as Class 4 aggregate subbase.

### 10-1.83 AGGREGATE BASE

Aggregate base must comply with Section 26, "Aggregate Bases," of the Standard Specifications and these special provisions.

Aggregate base must be Class 3.

Do not store reclaimed asphalt concrete or aggregate base with reclaimed asphalt concrete within 30 m measured horizontally of any culvert, watercourse, or bridge.

Class 3 aggregate base must comply with:

Grading (Percentage Passing)		
Sieve Sizes	19-mm Maximum	
	Operating Range	Contract Compliance
50-mm		
37.5-mm		
25-mm	100	100
19-mm	90-100	87-100
4.75-mm	35-60	30-65
600- $\mu$ m	10-30	5-35
75- $\mu$ m	2-11	0-14

Quality		
Tests	Operating Range	Contract Compliance
Sand Equivalent	25 Min	22 Min
Resistance (R-value)		78 Min
Durability Index		35 Min

Do not treat aggregate with lime, cement, or other chemical material before the Department performs the Durability Index test. The Engineer does not consider any untreated reclaimed asphalt concrete and portland cement concrete to be treated with lime, cement, or other chemical material for purposes of performing the Durability Index test.

If tests show grading or sand equivalent does not comply with the "Operating Range" specifications but complies with the "Contract Compliance" specifications, you may place aggregate base for the remainder of that day. Do not start another day's work until tests or other information indicate the next day's material complies with the "Operating Range" specifications.

If tests show grading or sand equivalent does not comply with the "Contract Compliance" specifications, remove the aggregate base represented by the tests. If you request and the Engineer approves, that aggregate base may remain in place and the Department reduces payment by \$3.25 per cubic meter for that aggregate base. If the base remains in place and both the grading and sand equivalent do not comply with "Contract Compliance" specifications, the Department only makes one payment reduction.

No single grading or sand equivalent test may represent more than the smaller of 400 m<sup>3</sup> or one day's production.

### 10-1.84 HOT MIX ASPHALT

#### GENERAL

##### Summary

This work includes producing and placing hot mix asphalt (HMA) Type A using the Standard process. Comply with Section 39, "Hot Mix Asphalt," of the Standard Specifications.

## **MATERIALS**

### **Asphalt Binder**

The grade of asphalt binder mixed with aggregate for HMA Type A must be PG 64-10.

### **Aggregate**


The aggregate for HMA Type A must comply with the 19-mm grading.

## **CONSTRUCTION**

### **Vertical Joints**

Before opening the lane to public traffic, pave shoulders and median borders adjacent to a lane being paved. Do not leave a vertical joint more than 45 mm high between adjacent lanes open to public traffic.

### **Widening**

If widening existing pavement, construct new structural section on both sides of the existing pavement to match the elevation of the existing pavement's edge at each location before placing HMA over the existing pavement.

### **Conform Tapers**

Place additional HMA along the pavement's edge to conform to road connections and private drives. Hand rake, if necessary, and compact the additional HMA to form a smooth conform taper.

## **10-1.85 MINOR HOT MIX ASPHALT**

### **GENERAL**

#### **Summary**

This work includes producing hot mix asphalt (HMA) at a central mixing plant and placing it as specified.

### **MATERIALS**

For minor HMA:

1. Do not submit a job mix formula.
2. Choose the 9.5-mm or 12.5-mm HMA Type A or Type B aggregate gradation under Section 39-1.02E, "Aggregate," of the Standard Specifications.
3. Minimum asphalt binder content must be 6.8 percent for 9.5-mm aggregate gradation and 6.0 percent for 12.5-mm aggregate gradation.
4. Choose asphalt binder Grade PG 64-10, PG 64-16, or PG 70-10 under Section 92, "Asphalts," of the Standard Specifications.

If you request and the Engineer authorizes, you may reduce the minimum asphalt binder content. Tack coat must comply with Section 39, "Hot Mix Asphalt," of the Standard Specifications.

### **CONSTRUCTION**

Spread and compact minor HMA by methods that produce an HMA surfacing:

1. Textured uniformly
2. Compacted firmly
3. Without depressions, humps, and irregularities

## **10-1.86 PRIME COAT GENERAL**

#### **Summary**

This work includes applying liquid asphalt prime coat. The Engineer designates areas receiving prime coat.

Comply with Section 93, "Liquid Asphalts," of the Standard Specifications.

## **MATERIALS**

Liquid asphalt for prime coat must be Grade SC-70.

## **CONSTRUCTION**

Apply at least 0.90 L of prime coat per square meter of designated area. Do not apply more prime coat than can be absorbed completely by the aggregate base in 24 hours.

You may request in writing the Engineer's approval to modify prime coat application rates.

Before paving, prime coat must cure for 48 hours.

Close public traffic to areas receiving prime coat. Do not track prime coat onto pavement surfaces beyond the job site.

## **MEASUREMENT AND PAYMENT**

The Engineer determines prime coat quantities under the specifications for liquid asphalt in Section 93-1.04, "Measurement," of the Standard Specifications.

The contract price paid per tonne for liquid asphalt (prime coat) includes full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in prime coat complete in place as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

If there is no contract item for liquid asphalt (prime coat), full compensation for furnishing and applying the prime coat is included in the contract price paid per tonne for hot mix asphalt as designated in the Engineer's Estimate and no separate payment will be made therefor.

## **10-1.87 JOINTED PLAIN CONCRETE PAVEMENT**

### **GENERAL**

Jointed plain concrete pavement shall be constructed in conformance with the provisions in Section 40, "Portland Cement Concrete Pavement," of the Standard Specifications and these special provisions, and as shown on the plans.

Insert method for forming joints in pavement shall not be used.

### **PREPAVING CONFERENCE**

Supervisory personnel of the Contractor and subcontractors who are to be involved in the concrete paving work shall meet with the Engineer at a prepaying conference, at a mutually agreed time, to discuss methods of accomplishing the paving work.

The Contractor shall provide a facility for the prepaying conference within 5 km of the construction site or at a nearby location agreed to by the Engineer. Attendance at the prepaying conference is mandatory for the Contractor's project superintendent, paving construction foreman, subcontractor's workers, including foremen and personnel performing saw cutting, joint sealing, concrete plant manager, and concrete plant operator. Conference attendees shall sign an attendance sheet provided by the Engineer. Production and placement shall not begin nor proceed unless the above-mentioned personnel have attended the mandatory prepaying conference.

### **JUST-IN-TIME TRAINING**

Attending a 4-hour Just-In-Time Training (JITT) shall be mandatory, and consist of a formal joint training class on portland cement concrete and paving techniques. Construction operations for portland cement concrete paving shall not begin until the Contractor's and the Engineer's personnel have completed the mandatory JITT. The Contractor's personnel included in the list of participants for the prepaying conference as well as the Engineer's representatives shall attend JITT. JITT shall be in addition to the prepaying conference.

The JITT class will be conducted for not less than 4 hours on portland cement concrete pavement and paving techniques. The training class may be an extension of the prepaying conference and shall be conducted at a project field location convenient for both the Contractor and the Engineer. The JITT class shall be completed at least 15 days, not including Saturdays or holidays, prior to the start of portland cement concrete paving operations. The class shall be held during normal working hours.

The JITT instructor shall be experienced in the construction methods, materials, and test methods associated with construction of portland cement concrete pavement and paving techniques. The instructor shall not be an employee of the Contractor or a member of the Engineer's field staff. A copy of the course syllabus, handouts, and presentation material shall be submitted to the Engineer at least 7 days before the day of the training. The

Contractor and the Engineer shall mutually agree to course instructor, the course content, and training site. The instructor shall issue a certificate of completion to the participants upon completion of the class. The certificate of completion shall include the course title, date and location of the class, the name of the participant, instructor's name, location and telephone number.

The Contractor's or Engineer's personnel involved with portland cement concrete paving operations will not be required to attend JITT if they have completed equivalent training within the previous 12 months of the date of the JITT for this project. The Contractor shall provide a certificate of class completion as described above for each staff member to be excluded from the JITT class. The Engineer will provide the final determination for exclusion of staff member's participation. Attendees of the JITT shall complete, and submit to the Engineer, an evaluation of the training. The Engineer will provide the course evaluation form.

Just-In-Time Training shall not relieve the Contractor of responsibility under the contract for the successful completion of the work in conformance with the requirements of the plans and specifications.

## **MATERIALS**

### **Concrete**

Attention is directed to Section 90, "Portland Cement Concrete," of the Standard Specifications, regarding mix proportions for concrete being determined by the Contractor.

Primary aggregate gradings shall conform to the gradation requirements of Section 90-3, "Aggregate Gradings," of the Standard Specifications. When combined in the proportions determined by the Contractor, the percent passing the 9.5 mm sieve and retained on the 2.36 mm sieve shall not be less than 16 percent of the total aggregate.

The cementitious material content shall not exceed 400 kg/m<sup>3</sup>.

### **Silicone Joint Sealant**

Low modulus silicone joint sealant shall be furnished in a one-part silicone formulation. Acid cure sealant shall not be used. The compound shall be compatible with the surface to which it is applied and shall conform to the following requirements:



Property	Test Method	Requirement
Tensile stress, 150% elongation, 7-day cure at 25° ± 1°C and 45% to 55% R.H. <sup>e</sup>	ASTM D 412 (Die C)	310 kPa max.
Flow at 25° ± 1°C	ASTM C 639 <sup>a</sup>	Shall not flow from channel
Extrusion Rate at 25° ± 1°C	ASTM C 603 <sup>b</sup>	75-250 g/min.
Specific Gravity	ASTM D 792 Method A	1.01 to 1.51
Durometer Hardness, at -18°C, Shore A, cured 7 days at 25° ± 1°C	ASTM C 661	10 to 25
Ozone and Ultraviolet Resistance, after 5000 hours	ASTM C 793	No chalking, cracking or bond loss
Tack free at 25° ± 1°C and 45% to 55% R.H. <sup>e</sup>	ASTM C 679	Less than 75 minutes
Elongation, 7 day cure at 25° ± 1°C and 45% to 55% R.H. <sup>e</sup>	ASTM D 412 (Die C)	500 percent min.
Set to Touch, at 25° ± 1°C and 45% to 55% R.H. <sup>e</sup>	ASTM D 1640	Less than 75 minutes
Shelf Life, from date of shipment	—	6 months min.
Bond, to concrete mortar-concrete briquettes, air cured 7 days at 25° ± 1°C	AASHTO T 132 <sup>c</sup>	345 kPa min.
Movement Capability and Adhesion, 100% extension at -18°C after, air cured 7 days at 25° ± 1°C, and followed by 7 days in water at 25° ± 1°C	ASTM C 719 <sup>d</sup>	No adhesive or cohesive failure after 5 cycles

Notes:

- a. ASTM Designation: C 639 Modified (15 percent slope channel A).
- b. ASTM Designation: C 603, through 3-mm opening at 345 kPa.
- c. Mold briquettes in conformance with AASHTO Designation: T 132, sawed in half and bonded with a 1.5 mm maximum thickness of sealant and tested in conformance with AASHTO Designation: T 132. Briquettes shall be dried to constant mass at 100 ± 5° C.
- d. Movement Capability and Adhesion: Prepare 305 mm x 25 mm x 75 mm concrete blocks in conformance with ASTM Designation: C 719. A sawed face shall be used for bond surface. Seal 50 mm of block leaving 12.5 mm on each end of specimen unsealed. The depth of sealant shall be 9.5 mm and the width 12.5-mm.
- e. R.H. equals relative humidity.

The silicone joint sealant shall be formulated to cure rapidly enough to prevent flow after application on grades of up to 15 percent.

A Certificate of Compliance for the silicone sealant shall be furnished to the Engineer in conformance with the provisions in Section 6-1.07, "Certificates of Compliance," of the Standard Specifications. The Certificate shall also be accompanied with a certified test report of the results of the required tests performed on the sealant material within the previous 12 months prior to proposed use. The Certificate and accompanying test report shall be provided for each lot of silicone joint sealant prior to use on the project.

### **Foam Backer Rods**

Foam backer rods shall be Type 1, conforming to the requirements of ASTM Designation: D 5249. Foam backer rods shall have a diameter prior to placement at least 25 percent greater than the width of the sawcut and shall be expanded, crosslinked, closed-cell polyethylene foam that is compatible with the joint sealant so that no bond or adverse reaction occurs between the rod and sealant. Hot applied sealant that will melt the foam backer rod shall not be used. The Contractor shall submit a manufacturer's data sheet verifying that the foam backer rod is compatible with the sealant to be used.

### **PAVEMENT CONCRETE MIX PROPORTIONS**

The Contractor shall determine the mix proportions for pavement concrete. The laboratory used to develop the mix proportions shall meet the requirements of ASTM Designation: C 1077, and shall have current AASHTO accreditation for test methods AASHTO Designation: T 97 or ASTM Designation: C 78, and AASHTO Designation: T 126 or ASTM Designation: C 192.

The minimum cementitious materials content or the maximum water to cementitious materials ratio shall be determined in conformance with the requirements in California Test 559. Trial mixtures shall be made no more than 24 months before field qualification. The minimum cementitious materials content or the maximum water to cementitious materials ratio shall be that determined from the trial mixtures curve to produce a minimum modulus of

rupture of 3.9 MPa at 28 days age and 4.5 MPa at 42 days age. To account for variances in materials, production of concrete, and modulus of rupture testing, the Contractor shall include as part of the proposed mix proportions an increase to the cementitious material content or a decrease to the water to cementitious materials ratio, determined from trial mixtures, to ensure that portland cement concrete produced during paving operations conforms to the requirements in "Modulus of Rupture," in this section.

At least 15 days prior to field qualification, the Contractor shall submit the proposed pavement concrete mix proportions with laboratory test reports. Laboratory test reports shall include modulus of rupture determined for each trial mixture at ages of 10, 21, 28 and 42 days in conformance with the applicable portions of California Test 559.

### **Field Qualification**

Field qualification of proposed mix proportions will be required prior to placement of pavement concrete. The Contractor shall perform field qualification and submit certified test data to the Engineer. Field qualification data shall be based upon the proposed use of materials, mix proportions, mixing equipment, procedures and size of batch.

Proposed concrete mix proportions will be field qualified when the test results of five beams from a single batch of concrete indicate the average modulus of rupture is at least 3.9 MPa with no single beam lower than 3.8 MPa at an age of the Contractor's choice but not later than 28 days. Beams shall be tested for modulus of rupture at a minimum of 10, 21, and 28 days of age. Test specimens shall be made and tested in conformance with the requirements in California Test 523.

The certified field qualification test data reports shall include the following:

1. Date of mixing,
2. Mixing equipment and procedures used,
3. Volume of batch in cubic meters and the mass or volume,
4. Type and source of ingredients used,
5. Penetration and slump of the concrete,
6. The air content of the concrete, and
7. The age at time of testing and strength of concrete specimens tested.

Field qualification test data reports shall be signed by a certified representative in charge of the laboratory that performed the tests.

If the Contractor changes a source of supply or proportions, the Contractor shall submit a new proposed mix design and furnish samples from the new source, or sources, at least 60 days prior to their intended use. The new mix proportions shall be trial batched and field qualified, unless, the Engineer determines the change is not substantive. No extension of contract time will be allowed for the time required to perform the sampling, testing, preparing and qualifying new mix proportions for new aggregate sources proposed by the Contractor.

### **MODULUS OF RUPTURE**

The Engineer will test portland cement concrete pavement for modulus of rupture in conformance with the requirements in California Test 523. Acceptance will be on a lot basis. Each lot shall not to exceed 750 m<sup>3</sup> of concrete pavement. The Engineer will determine sample locations. A minimum of six beam specimens shall be made from each sample. Beam specimens will be tested for modulus of rupture at 10, 21, and 28 days. The modulus of rupture for each lot will be calculated by averaging the results of two beams representing that lot tested at 28 days of age. The difference in modulus of rupture between each individual beam result shall not exceed 0.44-MPa.

The Contractor shall perform sampling and testing of beam specimens to determine if concrete pavement has achieved a modulus of rupture of 2.4 MPa when requesting early use of concrete pavement in conformance with the provisions in Section 90-8.03, "Protecting Concrete Pavement," of the Standard Specifications. Beam specimens shall be made and tested in conformance with the requirements in California Test 523.

### **LIQUID JOINT SEALANT INSTALLATION**

The joint sealant detail for transverse joints, as shown on the plans, shall apply only to weakened plane joints. Weakened plane joints shall be constructed by the sawing method. Should grinding or grooving be required over or adjacent to joints after sealant has been placed, the joint materials shall be removed and disposed of in conformance with the provisions in Section 7-1.13, "Disposal of Material Outside the Highway Right of Way," of the Standard Specifications, and replaced at the Contractor's expense. Immediately after sawing, a water wash using less than 0.7 MPa pressure shall be used to remove the slurry from the sawing operation.

Transverse weakened plane joints shall be Type A1 or B as shown on the plans. Seven days after the concrete pavement placement and not more than 4 hours before placing backer rods and joint sealant materials, the joint walls shall be cleaned by the dry sand blast method and other means as necessary to remove from the joint objectionable material such as soil, asphalt, curing compound, paint and rust. Sand blasting shall be performed in at least 2 passes, one for each side of the joint, with the nozzle held at an angle to the joint within 25 mm to 51 mm of the pavement. After cleaning the joint, traces of sand, dust and loose material shall be removed from and near the joint for a distance along the pavement surfaces of at least 50 mm on each side of the joint by the use of a vacuum device. Surface moisture or dampness shall be removed at the joints by means of compressed air or moderate hot compressed air or other means approved by the Engineer. Drying procedures that leave a residue or film on the joint wall shall not be used. Sandblasting equipment shall have a maximum nozzle diameter size of  $6 \pm 1$ -mm and a minimum pressure of 0.62-MPa.

Backer rods shall be installed when the temperature of the portland cement concrete pavement is above the dew point of the air and when the air temperature is 4°C or above. Backer rod shall be installed when the joints to be sealed have been properly patched, cleaned and dried, as determined by the Engineer. Methods of placing backer rod that leave a residue or film on joint walls shall not be used.

Immediately after placement of the backer rod, joint sealant shall be placed in the clean, dry, prepared joints as shown on the plans. The joint sealant shall be applied using a mechanical device with a nozzle shaped to fit inside the joint to introduce the sealant from inside the joint. Adequate pressure shall be applied to the sealant to ensure that the sealant material is extruded evenly and that full continuous contact is made with the joint walls. After application of the sealant, the surface of the sealant shall be recessed as shown on the plans.

Failure of the joint material in either adhesion or cohesion will be cause for rejection of the joint. The finished surface of joint sealant shall conform to the dimensions and allowable tolerances shown on the plans. Rejected joint materials or joint material whose finished surface does not conform to the dimensions shown on the plans, as determined by the Engineer, shall be repaired or replaced, at the Contractor's expense, with joint material that conforms to the requirements.

After each joint is sealed, surplus joint sealer on the pavement surface shall be removed. Traffic shall not be permitted over the sealed joints until the sealant is tack free and set sufficiently to prevent embedment of roadway debris into the sealant.

### **PREFORMED COMPRESSION JOINT SEAL INSTALLATION**

An installation machine specifically designed for the installation of preformed compression joint seals shall be used to install the seal at the specified depth without cutting, nicking, or twisting the seal. The installation machine shall install the seal with no more than 4 percent stretch in the installed seal. Hand installation methods of installing seals will not be permitted.

The percentage of stretch shall be determined by laying a length of the preformed compression joint seal material cut to the exact length of the pavement joint to be sealed. The length shall then be measured. The cut length of preformed compression joint seal material shall then be installed in the joint. Excess amount of seal material remaining at the end of the joint shall be measured as the amount of stretch. The measured amount of stretch shall be divided by the original measured length to determine the percentage of stretch.

The completed seal shall not be twisted or have deformities that prevent the seal from making complete continuous contact with the joint walls. Seals installed that are twisted or deformed, or do not make continuous contact with joint walls or with greater than 4 percent stretch of the joint material will be rejected and removed.

### **CONSTRUCTING TRANSVERSE CONTACT JOINTS**

A transverse contact (construction) joint shall be constructed at the end of each day's work or where concrete placement is interrupted for more than 30 minutes, to coincide with the next weakened plane joint location.

If sufficient concrete has not been mixed to form a slab to match the next weakened plane joint, when an interruption occurs, the excess concrete shall be removed and disposed of back to the last preceding joint. The cost of removing and disposing of excess concrete shall be at the Contractor's expense. Excess material shall become the property of the Contractor and shall be disposed of in conformance with the provisions in Section 7-1.13, "Disposal of Material Outside the Highway Right of Way," of the Standard Specifications.

A metal or wooden bulkhead (header) shall be used to form the joint. The bulkhead shall be designed to accommodate the installation of dowel bars.

### **CONSTRUCTING TRANSVERSE JOINT CONNECTIONS AND ANCHORS**

Concrete pavement joints at transitions to hot mix asphalt pavement, pavement end anchors and bridge approach slabs shall conform to the details as shown on the plans. Paint binder shall be applied to the concrete

surface that hot mix asphalt pavement will contact. Paint binder shall be applied in conformance with the provisions in Section 39, "Hot Mix Asphalt," of the Standard Specifications.

### **PROFILE INDEX**

The pavement surface shall be profiled, by the Contractor not more than 10 days following concrete placement, in the presence of the Engineer, using a California Profilograph or equivalent in conformance with the requirements in California Test 526, except a blanking band of zero (null) shall be used to determine the Profile Index. Two profiles shall be made within each traffic lane, one meter from and parallel with each lane line.

Profiled pavement shall conform to the following Profile Index requirements:

1. Pavement on tangent alignment and pavement on horizontal curves having a centerline radius of curve 600 m or more shall have a Profile Index of 64 mm or less for each 0.1-km.
2. Pavement on horizontal curves having a centerline radius of curve 300 m or more but less than 600 m and pavement within the superelevation transition of those curves shall have a Profile Index of 128 mm or less for each 0.1-km.

Individual high points in excess of 7.5 mm, as determined by measurements of the profilogram in conformance with the requirements in California Test 526, except using a blanking band of zero (null), shall be reduced by grinding in conformance with the requirements in Section 40-1.10, "Final Finishing," of the Standard Specifications until the high points as indicated by reruns of the profilograph do not exceed 7.5 mm.

Pavement grinding shall not be performed before 10 days have elapsed after concrete placement, nor before the concrete has developed a modulus of rupture of at least 3.8 MPa.

### **CONSTRUCTING WEAKENED PLANE JOINTS (EARLY ENTRY SAW METHOD)**

The Contractor may construct weakened plane joints using lighter weight concrete saws (early entry saws) specifically designed for sawing fresh concrete without the use of water. The early entry saws shall be capable of sawing joints within 2 hours of cure time after placement of the concrete pavement without ravelling or tearing, as defined in Section 40-1.08B(1), "Sawing Method," of the Standard Specifications. Joints sawed with early entry saws that develop random cracking shall be removed to the nearest controlled joint and replaced with concrete pavement containing dowel bars and tie bars in conformance with these special provisions and as shown on the plans. The removal and replacement work shall be at the Contractor's expense. Weakened plane joints not sawed within 2 hours of placing concrete pavement shall be sawed by conventional power driven wet-type concrete saws in conformance with the requirements of Section 40-1.08B(1), "Sawing Method," of the Standard Specifications.

Sawed grooves shall be cut to a maximum of 3 mm in width for longitudinal and transverse weakened plane joints made with early entry saws. The minimum depth of cut shall be calculated utilizing the formula in Section 40-1.08B(1), "Sawing Method," of the Standard Specifications except  $d = t/4$ .

### **MEASUREMENT AND PAYMENT**

Sealing longitudinal and transverse weakened plane joints, in portland cement concrete pavement will be measured by the meter. When a test strip conforms to the specifications for concrete pavement and remains a part of the project paving surface, the sealed pavement joints will be measured and paid for as seal pavement joint.

The contract price paid per meter for seal pavement joint shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in sealing pavement joints complete in place, including sawing, cleaning and preparing the joints in the concrete pavement, furnishing and installing backer rod, repairing and patching spalled or raveled sawed joints, and replacing or repairing rejected joints, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

Concrete pavement will be measured by the cubic meter in conformance with the provisions in Section 40-1.13, "Measurement," of the Standard Specifications. No deduction will be made for the volume of epoxy-coated dowel bars, epoxy-coated tie bars and, when used, tie bar baskets with fasteners and dowel bar baskets with fasteners, in the concrete pavement. When a test strip conforms to the specifications for concrete pavement and remains a part of the project paving surface, the concrete will be measured and paid for as concrete pavement.

The contract price paid per cubic meter for concrete pavement shall include full compensation for furnishing all labor, materials (including cementitious material in the amount determined by the Contractor), tools, equipment, and incidentals, and for doing all the work involved in constructing the portland cement concrete pavement complete in place, submittal to the Engineer all test data for determination of mix proportions of concrete for concrete pavement and for providing the facility, Contractor personnel and all the work involved in arranging and holding the prepaving conference, for constructing and repairing all joints; for performing all profile checks for Profile Index and

furnishing final profilograms to the Engineer; for grooving and grinding required for final finishing; and for removing, and replacing pavement for deficient thickness, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

Costs for providing JITT will be determined in conformance with the provisions in Section 9-1.03, "Force Account Payment," of the Standard Specifications, except no markups shall be added, and the Contractor will be paid for one half of the JITT cost. Costs for providing JITT shall include training materials, class site, and the JITT instructor including the JITT instructor's travel, lodging, meals and presentation materials. All costs incurred by the Contractor or Engineer for attending JITT shall be borne by the party incurring the costs.

## **10-1.88 PILING**

### **GENERAL**

Piling shall conform to the provisions in Section 49, "Piling," of the Standard Specifications, and these special provisions.

Concrete for cast-in-place concrete piling shall be prequalified in conformance with the provisions in Section 90-9, "Compressive Strength," of the Standard Specifications.

Unless otherwise specified, welding of any work performed in conformance with the provisions in Section 49, "Piling," of the Standard Specifications, shall be in conformance with the requirements in AWS D1.1.

Epoxy coated reinforcement for pile anchorages shall conform to "Epoxy-Coated Prefabricated Reinforcement," of these special provisions.

When at any location the foundation excavation extends below the planned bottom of footing elevation, the Contractor shall notify the Engineer who may determine that adjustments to pile tip elevations are required. Pile tip elevation adjustments resulting from Contractor's overexcavation are considered to be for Contractor's convenience and any additional pile length shall be at Contractor's expense.

Attention is directed to "Supplemental Project Information,"- and "Welding" of these special provisions.

If at any time during pile driving the blow count exceeds three times the required blow count as determined from Section 49, "Piling," of the Standard Specifications, the Contractor shall discontinue driving. If the pile tip is less than 1.5 m above the specified tip elevation it will be accepted; if the pile tip is more than or equal to 1.5 m above the specified tip elevation, the Contractor shall notify the Engineer who may direct that remedial measures be undertaken. Driving shall not resume until directed by the Engineer.

Attention is directed to "Order of Work", "Permits, Licenses, Agreements, and Certifications," of these special provisions regarding permit restrictions and regulations that may impact pile installation.

Soil samples are available for inspection as specified in "Supplemental Project Information," of these special provisions.

The requirements in Section 49-1.03, "Determination of Length," of the Standard Specifications shall not apply.

Driven piling shall be installed and shall be of such length as required to obtain the specified pile tip elevation and to extend into the pile cap, as shown on the plans.

All piles shall be clearly marked along their entire length in increments of 250 mm with more prominent markings every meter. Marking shall be made by white paint lines 50 mm wide. Markings shall be accurately placed on the pile with a tape measure that is at least 30 meters in length such that the intended measurement is true at the bottom of the marking. Markings shall be visible from all directions and shall indicate cumulative length from the pile toe.

Difficult pile installation is anticipated due to the presence of cemented and dense soils, sloping ground, caving soils, contaminated materials, cobbles and boulders, rock, subsurface concrete debris, and underground utilities.

When a calculated nominal driving resistance is shown on the plans for piling, that value shall be utilized in lieu of nominal resistance in Section 49, "Piling," of the Standard Specifications, the plans, and these special provisions.

### **Driving System Submittal**

Prior to installing driven piling, the Contractor shall provide a driving system submittal, including driveability analysis, in conformance with the provisions in "Working Drawings" of these special provisions. A submittal shall be made for each control location shown below. All proposed driving systems (i.e., each hammer that may be brought onto the site) shall be included in the submittal.

Bridge Number	Control Location
34-0006S	EB On-Ramp (Final), Bent W10, Abutment W11

The driving system submittal shall contain an analysis showing that the proposed driving systems will install piling to the specified tip elevation and specified bearing. Driving systems shall generate sufficient energy to drive

the piles with stresses not more than 95 percent of the specified yield strength of the steel pile or unfilled steel shell. Submittals shall include the following:

- A. Complete description of soil parameters used, including soil quake and damping coefficients, skin friction distribution, ratio of shaft resistance to nominal compression resistance, assumptions made regarding the formation of soil plugs, and assumptions made regarding drilling through the center of open ended steel shells.
- B. List of all hammer operation parameters assumed in the analysis, including fuel settings, stroke limitations, and hammer efficiency.
- C. Driveability studies that are based on a wave equation analysis using a computer program that has been approved by the Engineer. Driveability studies shall model the Contractor's proposed driving systems, including the hammers, capblocks, and pile cushions, as well as determine driving resistance and pile stresses for assumed site conditions. Separate analyses shall be completed at elevations above the specified tip elevations where difficult driving is anticipated. Studies shall include plots for a range of pile compression capacities above and below the nominal compression resistance shown on the plans. Plots shall include the following:
  - 1. Pile compressive stress versus blows per 0.30-m.
  - 2. Pile tensile stress versus blows per 0.30-m.
  - 3. Nominal compression resistance versus blows per 0.30-m.

When the driveability analysis hammers indicate that open ended pipe pile and steel shell penetration rates are less than 0.30-m per 200 blows and the driving stresses will exceed 80 percent of the specified yield strength of the pipe and steel shell, the study shall include assumptions for drilling through the center of open ended pipe piles and steel shells.

- D. Copies of all test results from any previous pile load tests, dynamic monitoring, and all driving records used in the analyses.
- E. Completed "Pile and Driving Data Form," which is shown in these special provisions.

The driving system submittal shall be stamped and signed by an engineer who is registered as a Civil Engineer in the State of California. Prior to installing piling, the Contractor shall allow the Engineer 15 working days to review a driving system submittal after a complete set, as determined by the Engineer, has been received. Should the Engineer fail to complete his review within the time allowance, and if, in the opinion of the Engineer, the Contractor's controlling operation is delayed or interfered with by reason of the delay in the driving system submittal review, the delay will be considered a right of way delay in conformance with the provisions in Section 8-1.09, "Right of Way Delays" of the Standard Specifications.

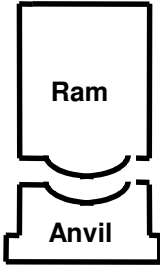

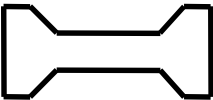

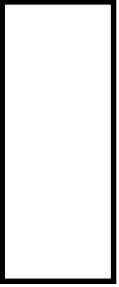
The Contractor shall use the driving system and installation methods described in the approved driving system submittal for a given control location. Any change in hammers from those submitted and approved by the Engineer shall also meet the requirements for driving system submittals. Revised and new driving system submittals shall be approved by the Engineer prior to using corresponding driving systems on production piling. The Contractor shall allow the Engineer 15 working days to review each revised and each new driving system submittal after a complete set, as determined by the Engineer, has been received.

Approval of pile driving equipment will not relieve the Contractor of his responsibility to drive piling, free of damage, to the specified penetration and to pile acceptance criteria.

CALIFORNIA DEPARTMENT OF TRANSPORTATION  
TRANSPORTATION LABORATORY

# PILE AND DRIVING DATA FORM

Structure Name : \_\_\_\_\_ Contract No.: \_\_\_\_\_  
 \_\_\_\_\_ Project: \_\_\_\_\_  
 Structure No.: \_\_\_\_\_ Pile Driving Contractor or  
 Dist./Co./Rte./kilo.post: \_\_\_\_\_ Subcontractor \_\_\_\_\_ (Pile Driven By)

	<b>Hammer</b>	Manufacturer: _____ Model: _____ Type: _____ Serial No.: _____ Rated Energy: _____ at _____ Length of Stroke _____ Modifications: _____ _____ _____ _____
	<b>Capblock (Hammer Cushion)</b>	Material: _____ Thickness: _____ mm Area: _____ mm <sup>2</sup> Modulus of Elasticity - E: _____ MPa Coefficient of Restitution - e: _____
	<b>Pile Cap</b>	<div style="display: flex; align-items: center;"> <div style="border: 1px solid black; padding: 2px; margin-right: 10px;">           Helmet Bonnet Anvil Block Drivehead         </div> <div>           Mass: _____ k         </div> </div>
	<b>Pile</b>	Material: _____ Thickness: _____ mm Area: _____ mm <sup>2</sup> Modulus of Elasticity - E: _____ MPa Coefficient of Restitution - e: _____
	<b>Pile</b>	Pile Type: _____ Length (In Leads): _____ m kg/m.: _____ Taper: _____ Wall Thickness: _____ mm Cross Sectional Area: _____ mm <sup>2</sup> Design Pile Capacity: _____ kN Description of Splice: _____ _____ Tip Treatment Description: _____

**DISTRIBUTE one copy**

☐ Translab,  
Foundation Testing

☐ Translab,  
Geotechnical Design

☐ Resident Engineer

Note: If mandrel is used to drive the pile, attach separate manufacturer's detail sheet(s) including mass (kg) and dimensions.

Submitted By: \_\_\_\_\_ Date: \_\_\_\_\_

## **Jetting and Drilling**

Jetting to obtain the specified penetration in conformance with the provisions in Section 49-1.05, "Driving Equipment," of the Standard Specifications shall not be used for driven type piles.

Drilling to obtain the specified penetration in conformance with the provisions in Section 49-1.05, "Driving Equipment," of the Standard Specifications shall not be used for driven type piles except where obstructions are encountered. Should such obstructions be encountered, the Contractor shall provide special driving tips or heavier pile sections, subexcavate below the bottom of footing, predrill or core holes not greater than the least dimension of the pile to the proper depth, spud the piles, or take other measures to prevent damage to the pile during driving. Predrilling, if used, shall be terminated above the pile tip at all times.

Materials resulting from drilling holes shall be disposed of in conformance with the provisions in Section 19-2.06, "Surplus Material," of the Standard Specifications.

## **CAST-IN-DRILLED-HOLE CONCRETE PILES**

### **GENERAL**

#### **Summary**

Cast-in-drilled-hole (CIDH) concrete piling shall conform to the provisions in Section 49-4, "Cast-In-Place Concrete Piles," of the Standard Specifications and these special provisions.

The provisions of "Welding" of these special provisions shall not apply to temporary steel casings.

### **SUBMITTALS**

#### **Pile Installation Plan**

The Contractor shall submit a pile installation plan to the Engineer for approval for all CIDH concrete piling. The pile installation plan shall be submitted at least 15 days before constructing CIDH concrete piling and shall include complete descriptions, details, and supporting calculations for the following:

- A. Concrete mix design, certified test data, and trial batch reports.
- B. Drilling or coring methods and equipment.
- C. Proposed method for casing installation and removal when necessary.
- D. Plan view drawing of pile showing reinforcement. Include inspection pipes on the drawing, if inspection pipes are required.
- E. Methods for placing, positioning, and supporting bar reinforcement.
- F. Methods and equipment for determining the depth of concrete and actual and theoretical volume placed, including effects on volume of concrete when any casings are withdrawn.
- G. Methods and equipment for verifying that the bottom of the drilled hole is clean before placing concrete.
- H. Methods and equipment for preventing upward movement of reinforcement, including the Contractor's means of detecting and measuring upward movement during concrete placement operations.

For concrete placed under slurry, the pile installation plan shall also include complete descriptions, details, and supporting calculations for the following:

- A. Concrete batching, delivery, and placing systems, including time schedules and capacities. Time schedules shall include the time required for each concrete placing operation at each pile.
- B. Concrete placing rate calculations. When requested by the Engineer, calculations shall be based on the initial pump pressures or static head on the concrete and losses throughout the placing system, including anticipated head of slurry and concrete to be displaced.
- C. Suppliers' test reports on the physical and chemical properties of the slurry and any proposed slurry chemical additives, including Material Safety Data Sheet.
- D. Slurry testing equipment and procedures.
- E. Methods of removal and disposal of excavation, slurry, and contaminated concrete, including removal rates.
- F. Methods and equipment for slurry agitating, recirculating, and cleaning.

### **QUALITY ASSURANCE**

#### **Concrete Test Batch**

Before concrete is deposited under slurry, a concrete test batch shall be produced and delivered to the project under conditions and in time periods similar to those expected during placement of concrete in the piles. Concrete shall be placed in an excavated hole or suitable container of adequate size to allow for testing as specified herein.



Depositing of concrete under slurry will not be required. In addition to meeting the specified nominal slump, the concrete test batch shall meet the following requirements:

- A. For piles where the time required for each concrete placing operation, as submitted in the placing plan, will be 2 hours or less, the concrete test batch shall demonstrate that the proposed concrete mix design achieves a slump of at least 175 mm after twice that time has elapsed.
- B. For piles where the time required for each concrete placing operation, as submitted in the placing plan, will be more than 2 hours, the concrete test batch shall demonstrate that the proposed concrete mix design achieves a slump of at least 175 mm after that time plus 2 hours has elapsed.

The time period shall begin at the start of placement. Concrete shall not be vibrated or agitated during the test period. Slump tests will be performed in conformance with the requirements in California Test 556.

Upon completion of testing, concrete shall be disposed of in conformance with the provisions in Section 7-1.13, "Disposal of Material Outside the Highway Right of Way," of the Standard Specifications.

## **MATERIALS**

### **Concrete**

Concrete deposited under slurry shall have a nominal slump equal to or greater than 175 mm, contain not less than 400 kilograms of cementitious material per cubic meter, and be proportioned to prevent excessive bleed water and segregation. The nominal and maximum slump and penetration requirements in Section 90-6.06, "Amount of Water and Penetration," of the Standard Specifications shall not apply.

Concrete shall conform to the requirements in "Corrosion Control for Portland Cement Concrete" of these special provisions.

### **Aggregate Grading**

The combined aggregate grading shall be either the 25-mm maximum grading, the 12.5-mm maximum grading, or the 9.5-mm maximum grading and shall conform to the requirements in Section 90-3, "Aggregate Gradings," of the Standard Specifications.

When concrete is placed under slurry, the combined aggregate grading shall be either the 12.5-mm maximum grading or the 9.5-mm maximum grading and shall conform to the requirements in Section 90-3, "Aggregate Gradings," of the Standard Specifications.

### **Permanent Steel Casings**

Permanent steel casings shall conform to the provisions of "Steel Pipe Piling" of these special provisions.

### **Grout**

Grout used to backfill casings shall conform to the provisions in Section 50-1.09, "Bonding and Grouting," of the Standard Specifications. Aggregate shall be used to extend the grout, but only to the extent that the cement content of the grout is not less than 501 kilograms per cubic meter of grout. California Test 541 will not be required nor will the grout be required to pass through a sieve with a 1.8-mm maximum clear opening before being introduced into the grout pump. Aggregate shall consist of at least 70 percent fine aggregate and approximately 30 percent pea gravel, by weight. Fine aggregate shall conform to the provisions of Section 90-2, "Materials," of the Standard Specifications. The size of pea gravel shall be such that 100 percent passes the 12.5-mm sieve, a minimum 90 percent passes the 9.5-mm sieve, and not more than 5 percent passes the No.2.36-mm sieve.

### **Slurry**

#### **Mineral Slurry**

Mineral slurry shall be mixed and thoroughly hydrated in slurry tanks, and slurry shall be sampled from the slurry tanks and tested before placement in the drilled hole.

Slurry shall be recirculated or continuously agitated in the drilled hole to maintain the specified properties.

Recirculation shall include removal of drill cuttings from the slurry before discharging the slurry back into the drilled hole. When recirculation is used, the slurry shall be sampled and tested at least every 2 hours after beginning its use until tests show that the samples taken from the slurry tank and from near the bottom of the hole have consistent specified properties. Subsequently, slurry shall be sampled at least twice per shift as long as the specified properties remain consistent.

Slurry that is not recirculated in the drilled hole shall be sampled and tested at least every 2 hours after beginning its use. The slurry shall be sampled mid-height and near the bottom of the hole. Slurry shall be

recirculated when tests show that the samples taken from mid-height and near the bottom of the hole do not have consistent specified properties.

Slurry shall also be sampled and tested prior to final cleaning of the bottom of the hole and again just prior to placing concrete. Samples shall be taken from mid-height and near the bottom of the hole. Cleaning of the bottom of the hole and placement of the concrete shall not start until tests show that the samples taken from mid-height and near the bottom of the hole have consistent specified properties.

Mineral slurry shall be tested for conformance to the requirements shown in the following table:

MINERAL SLURRY		
PROPERTY	REQUIREMENT	TEST
Density (kg/m <sup>3</sup> ) - before placement in the drilled hole - during drilling - prior to final cleaning - immediately prior to placing concrete	1030* to 1110*  1030* to 1200*	Mud Weight (Density) API 13B-1 Section 1
Viscosity (seconds/liter) bentonite attapulgate	29 to 53  29 to 42	Marsh Funnel and Cup API 13B-1 Section 2.2
pH	8 to 10.5	Glass Electrode pH Meter or pH Paper
Sand Content (percent) - prior to final cleaning - immediately prior to placing concrete	less than or equal to 4.0	Sand API 13B-1 Section 5
*When approved by the Engineer, slurry may be used in salt water, and the allowable densities may be increased up to 32 kg/m <sup>3</sup> . Slurry temperature shall be at least 4°C when tested.		

Any caked slurry on the sides or bottom of hole shall be removed before placing reinforcement. If concrete is not placed immediately after placing reinforcement, the reinforcement shall be removed and cleaned of slurry, the sides of the drilled hole cleaned of caked slurry, and the reinforcement again placed in the hole for concrete placement.

### **Synthetic Slurry**

Synthetic slurries shall be used in conformance with the manufacturer's recommendations and these special provisions. The following synthetic slurries may be used:

PRODUCT	MANUFACTURER
SlurryPro CDP	KB Technologies Ltd. 3648 FM 1960 West Suite 107 Houston, TX 77068 (800) 525-5237
Super Mud	PDS Company c/o Champion Equipment Company 8140 East Rosecrans Ave. Paramount, CA 90723 (562) 634-8180
Shore Pac GCV	CETCO Drilling Products Group 1350 West Shure Drive Arlington Heights, IL 60004 (847) 392-5800
Novagel Polymer	Geo-Tech Drilling Fluids 220 N. Zapata Hwy, Suite 11A Laredo, TX 78043 (210) 587-4758

Inclusion of a synthetic slurry on the above list may be obtained by meeting the Department's requirements for synthetic slurries. The requirements can be obtained from the Office of Structure Design, P.O. Box 942874, Sacramento, CA 94274-0001.

Synthetic slurries listed may not be appropriate for a given site.

Synthetic slurries shall not be used in holes drilled in primarily soft or very soft cohesive soils as determined by the Engineer.

A manufacturer's representative, as approved by the Engineer, shall provide technical assistance for the use of their product, shall be at the site prior to introduction of the synthetic slurry into a drilled hole, and shall remain at the site until released by the Engineer.

Synthetic slurries shall be sampled and tested at both mid-height and near the bottom of the drilled hole. Samples shall be taken and tested during drilling as necessary to verify the control of the properties of the slurry. Samples shall be taken and tested when drilling is complete, but prior to final cleaning of the bottom of the hole. When samples are in conformance with the requirements shown in the following tables for each slurry product, the bottom of the hole shall be cleaned and any loose or settled material removed. Samples shall be obtained and tested after final cleaning and immediately prior to placing concrete.

SlurryPro CDP synthetic slurries shall be tested for conformance to the requirements shown in the following table:

SLURRYPRO CDP KB Technologies Ltd.		
PROPERTY	REQUIREMENT	TEST
Density (kg/m <sup>3</sup> ) - during drilling  - prior to final cleaning - just prior to placing concrete	less than or equal to 1075*  less than or equal to 1025*	Mud Weight (Density) API 13B-1 Section 1
Viscosity (seconds/liter) - during drilling  - prior to final cleaning - just prior to placing concrete	53 to 127  less than or equal to 74	Marsh Funnel and Cup API 13B-1 Section 2.2
pH	6 to 11.5	Glass Electrode pH Meter or pH Paper
Sand Content (percent) - prior to final cleaning - just prior to placing concrete	less than or equal to 0.5	Sand API 13B-1 Section 5
*When approved by the Engineer, slurry may be used in salt water, and the allowable densities may be increased up to 32 kg/m <sup>3</sup> . Slurry temperature shall be at least 4°C when tested.		

Super Mud synthetic slurries shall be tested for conformance to the requirements shown in the following table:

SUPER MUD PDS Company		
PROPERTY	REQUIREMENT	TEST
Density (kg/m <sup>3</sup> ) - prior to final cleaning - just prior to placing concrete	less than or equal to 1025*	Mud Weight (Density) API 13B-1 Section 1
Viscosity (seconds/liter) - during drilling  - prior to final cleaning - just prior to placing concrete	34 to 64  less than or equal to 64	Marsh Funnel and Cup API 13B-1 Section 2.2
pH	8 to 10.0	Glass Electrode pH Meter or pH Paper
Sand Content (percent) - prior to final cleaning - just prior to placing concrete	less than or equal to 0.5	Sand API 13B-1 Section 5
<p>*When approved by the Engineer, slurry may be used in salt water, and the allowable densities may be increased up to 32 kg/m<sup>3</sup>.</p> <p>Slurry temperature shall be at least 4°C when tested.</p>		

Shore Pac GCV synthetic slurries shall be tested for conformance to the requirements shown in the following table:

Shore Pac GCV CETCO Drilling Products Group		
PROPERTY	REQUIREMENT	TEST
Density (kg/m <sup>3</sup> ) - prior to final cleaning - just prior to placing concrete	less than or equal to 1025*	Mud Weight (Density) API 13B-1 Section 1
Viscosity (seconds/liter) - during drilling  - prior to final cleaning - just prior to placing concrete	35 to 78  less than or equal to 60	Marsh Funnel and Cup API 13B-1 Section 2.2
pH	8.0 to 11.0	Glass Electrode pH Meter or pH Paper
Sand Content (percent) - prior to final cleaning - just prior to placing concrete	less than or equal to 0.5	Sand API 13B-1 Section 5
<p>*When approved by the Engineer, slurry may be used in salt water, and the allowable densities may be increased up to 32 kg/m<sup>3</sup>.</p> <p>Slurry temperature shall be at least 4°C when tested.</p>		

Novagel Polymer synthetic slurries shall be tested for conformance to the requirements shown in the following table:

NOVAGEL POLYMER Geo-Tech Drilling Fluids		
PROPERTY	REQUIREMENT	TEST
Density (kg/m <sup>3</sup> )  - during drilling  - prior to final cleaning - just prior to placing concrete	less than or equal to 1075*  less than or equal to 1025*	Mud Weight (Density) API 13B-1 Section 1
Viscosity (seconds/liter)  - during drilling  - prior to final cleaning - just prior to placing concrete	48 to 110  less than or equal to 110	Marsh Funnel and Cup API 13B-1 Section 2.2
pH	6.0 to 11.5	Glass Electrode pH Meter or pH Paper
Sand Content (percent)  - prior to final cleaning - just prior to placing concrete	less than or equal to 0.5	Sand API 13B-1 Section 5
<p>*When approved by the Engineer, slurry may be used in salt water, and the allowable densities may be increased up to 32 kg/m<sup>3</sup>.</p> <p>Slurry temperature shall be at least 4°C when tested.</p>		

### Water Slurry

At the option of the Contractor, water may be used as slurry when casing is used for the entire length of the drilled hole.

Water slurry shall be tested for conformance to the requirements shown in the following table:

WATER SLURRY		
PROPERTY	REQUIREMENT	TEST
Density (kg/m <sup>3</sup> ) - prior to final cleaning - just prior to placing concrete	1017 *	Mud Weight (Density) API 13B-1 Section 1
Sand Content (percent) - prior to final cleaning - just prior to placing concrete	less than or equal to 0.5	Sand API 13B-1 Section 5
*When approved by the Engineer, salt water slurry may be used, and the allowable densities may be increased up to 32 kg/m <sup>3</sup> .		

## CONSTRUCTION

### General

CIDH concrete piling 600 mm in diameter or larger may be constructed by excavation and depositing concrete under slurry.

Disposal of drill cuttings shall conform to the provisions in Handling, Transportation, and Disposal of Contaminated Material," of these special provisions.

Portions of CIDH concrete piling shown on the plans to be formed shall be formed and finished in conformance with the provisions for concrete structures in Section 51, "Concrete Structures," of the Standard Specifications.

Reinforcement shall extend to 80 mm clear of the bottom of the drilled hole when the hole is drilled below the specified tip elevation.

### Permanent Steel Casing Installation

Permanent steel casings shall be installed by impact or vibratory hammers, oscillators, rotators, or by placing in a drilled hole. The provisions of Section 49-1.08, "Pile Driving Acceptance Criteria," of the Standard Specifications shall not apply to permanent steel casings.

Permanent steel casings placed in a drilled hole shall conform to the following requirements:

- A. Casings shall be positioned with spacers to center the casing inside the drilled hole. Spacers may be welded to the outside of the casing.
- B. Voids in the annular space between the casing and the soil shall be filled with grout.
- C. Grout shall be placed from the bottom of the casing using grout tubes. Placement of grout shall continue until all voids have been filled and the grout reaches the top of the casing. Free fall of the grout from the top to the bottom of the casing will not be allowed.
- D. Grout shall be pumped into the annular space such that the grout head is maintained uniformly around the casing and no visible evidence of water or air is ejected at the top of the grout.
- E. One grout tube shall be placed every 1.2 meters along the circumference of the casing with a minimum of 4 grout tubes per casing.
- F. Grout tubes shall extend down to no less than 1 foot from the bottom of the casing.

### Placing Concrete

Concrete deposited under slurry shall be carefully placed in a compact, monolithic mass and by a method that will prevent washing of the concrete. Concrete deposited under slurry need not be vibrated. Placing concrete shall be a continuous operation lasting not more than the time required for each concrete placing operation at each pile, as submitted in the placing plan, unless otherwise approved in writing by the Engineer. Concrete shall be placed with



concrete pumps and delivery tube system of adequate number and size to complete the placing of concrete in the time specified. The delivery tube system shall consist of one of the following:

- A. A tremie tube or tubes, each of which are at least 250 in diameter, fed by one or more concrete pumps.
- B. One or more concrete pump tubes, each fed by a single concrete pump.

The delivery tube system shall consist of watertight tubes with sufficient rigidity to keep the ends always in the mass of concrete placed. If only one delivery tube is utilized to place the concrete, the tube shall be placed near the center of the drilled hole. Multiple tubes shall be uniformly spaced in the hole. Internal bracing for the steel reinforcing cage shall accommodate the delivery tube system. Tremies shall not be used for piles without space for a 250-mm tube.

Spillage of concrete into the slurry during concrete placing operations shall not be allowed. Delivery tubes shall be capped with a watertight cap, or plugged above the slurry level with a good quality, tight fitting, moving plug that will expel the slurry from the tube as the tube is charged with concrete. The cap or plug shall be designed to be released as the tube is charged. The pump discharge or tremie tube shall extend to the bottom of the hole before charging the tube with concrete. After charging the delivery tube system with concrete, the flow of concrete through a tube shall be induced by slightly raising the discharge end. During concrete placement, the tip of the delivery tube shall be maintained as follows to prevent reentry of the slurry into the tube. Until at least 3 meters of concrete has been placed, the tip of the delivery tube shall be within 150 mm of the bottom of the drilled hole, and then the embedment of the tip shall be maintained at least 3 meters below the top surface of the concrete. Rapid raising or lowering of the delivery tube shall not be permitted. If the seal is lost or the delivery tube becomes plugged and must be removed, the tube shall be withdrawn, the tube cleaned, the tip of the tube capped to prevent entrance of the slurry, and the operation restarted by pushing the capped tube 3 meters into the concrete and then reinitiating the flow of concrete.

When slurry is used, a fully operational standby concrete pump, adequate to complete the work in the time specified, shall be provided at the site during concrete placement. The slurry level shall be maintained 3 meters above the piezometric head or within 300 mm of the top of the drilled hole, whichever is higher.

A log of concrete placement for each drilled hole shall be maintained by the Contractor when concrete is deposited under slurry. The log shall show the pile location, tip elevation, dates of excavation and concrete placement, total quantity of concrete deposited, length and tip elevation of any casing, and details of any hole stabilization method and materials used. The log shall include a 215 mm x 280 mm sized graph of the concrete placed versus depth of hole filled. The graph shall be plotted continuously throughout placing of concrete. The depth of drilled hole filled shall be plotted vertically with the pile tip oriented at the bottom and the quantity of concrete shall be plotted horizontally. Readings shall be made at least at each 1.5 meters of pile depth, and the time of the reading shall be indicated. The graph shall be labeled with the pile location, tip elevation, cutoff elevation, and the dates of excavation and concrete placement. The log shall be delivered to the Engineer within one working day of completion of placing concrete in the pile.

After placing reinforcement and before placing concrete in the drilled hole, if drill cuttings settle out of the slurry, the bottom of the drilled hole shall be cleaned. The Contractor shall verify that the bottom of the drilled hole is clean.

If a temporary casing is used, concrete placed under slurry shall be maintained at a level at least 1.5 meters above the bottom of the casing. The withdrawal of the casing shall not cause contamination of the concrete with slurry. If slurry is not used, the temporary casing shall not be withdrawn until the concrete head in the casing is greater than the groundwater outside of the casing. This positive concrete head shall be maintained during the withdrawal of the casing.

Material, which is classified as non contaminated materials as shown on the plans and is resulting from using slurry, shall be disposed of in conformance with the provisions in Section 7-1.13, "Disposal of Material Outside the Highway Right of Way," of the Standard Specifications.

Contaminated materials, which are shown on the plans and are resulting from using slurry, shall conform to the provisions in "Handling, Transportation, and Disposal of Contaminated Material," of these special provisions.

### **Acceptance Testing and Mitigation**

Vertical inspection pipes for acceptance testing shall be provided in all CIDH concrete piling 600 mm in diameter or larger, except when the holes are dry or when the holes are dewatered without the use of temporary casing in a manner that controls ground water.

The furnishing and placing of inspection pipes shall conform to the following:

- A. Inspection pipes shall be Schedule 40 PVC pipe with a nominal inside diameter of 50 mm. Watertight PVC couplers are permitted to facilitate pipe lengths in excess of those which are commercially available. The

Contractor shall log the location of the inspection pipe couplers with respect to the plane of pile cut off, and these logs shall be delivered to the Engineer upon completion of the placement of concrete in the drilled hole.

- B. Each inspection pipe shall be capped at the bottom and shall extend from 0.9 meter above the pile cutoff down to the bottom of the reinforcing cage. A temporary top cap or similar means shall be provided to keep the pipes clean before testing. If pile cutoff is below the ground surface or working platform, inspection pipes shall be extended to 0.9 meter above the ground surface or working platform. Approved covers or railings shall be provided and inspection pipes shall be located as necessary to minimize exposure of testing personnel to potential falling hazards.
- C. Inspection pipes shall be completely clean, dry, and unobstructed at the time of testing providing a 50 mm diameter clear opening.
- D. The inspection pipes shall be installed in straight alignment, parallel to the main reinforcement, and securely fastened in place to prevent misalignment during installation of the reinforcement and placing of concrete in the hole. The CIDH concrete piling shall be constructed so that the relative distance of inspection pipes to vertical steel reinforcement shall remain constant.
- E. When any changes are made to the tip of CIDH concrete piling, the Contractor shall also extend the inspection pipes to the bottom of the reinforcing cage.

The following additional requirements apply if inspection pipes are not shown on the plans:

- A. Inspection pipes shall be placed radially around the pile, inside the outermost spiral or hoop reinforcement and no more than 25 mm clear of the outermost spiral or hoop reinforcement.
- B. Inspection pipes shall be placed around the pile at a uniform spacing not exceeding 840 mm measured along the circle passing through the centers of inspection pipes. A minimum of 2 inspection pipes per pile shall be used. Inspection pipes shall be placed to provide the maximum diameter circle that passes through the centers of the inspection pipes while maintaining the spacing required herein.
- C. Inspection pipes shall be placed a minimum of 75 mm clear of the vertical reinforcement. When the vertical reinforcement configuration does not permit this clearance while achieving radial location requirements, distance to vertical rebar shall be maximized while still maintaining the requirement for radial location.
- D. Where the dimensions of the pile reinforcement do not permit inspection pipes to be placed per these requirements, a plan for tube placement shall be submitted to the Engineer for approval in the Pile Placement Plan with a request for deviation before fabricating pile reinforcement.

After placing concrete and before requesting acceptance tests, each inspection pipe shall be tested by the Contractor in the presence of the Engineer by passing a 32 mm diameter rigid cylinder 1.375 meters long through the length of pipe. If an inspection pipe fails to pass the 32-mm-diameter cylinder, the Contractor shall immediately fill all inspection pipes in the pile with water.

For each inspection pipe that does not pass the 32-mm diameter cylinder, the Contractor shall core a nominal 50-mm diameter hole through the concrete for the entire length of the pile. Cored holes shall be located as close as possible to the inspection pipes they are replacing and shall be no more than 125 mm clear from the reinforcement.

Coring shall not damage the pile reinforcement. Cored holes shall be made with a double wall core barrel system utilizing a split tube type inner barrel. Coring with a solid type inner barrel will not be allowed. Coring methods and equipment shall provide intact cores for the entire length of the pile. The coring operation shall be logged by an Engineering Geologist or Civil Engineer licensed in the State of California and experienced in core logging. Coring logs shall be in conformance with the Department's "Soil and Rock Logging, Classification, and Presentation Manual." Coring logs shall include Core Recovery (REC), Rock Quality Designation (RQD), locations of breaks, and complete descriptions of inclusions and voids encountered during coring, and shall be delivered to the Engineer upon completion. Concrete cores shall be preserved, identified with the exact location the core was recovered from within the pile, and delivered to the Engineer upon completion. The Engineer will evaluate the portion of the pile represented by the cored hole based on the submitted core logs.

Acceptance tests of the concrete will be made by the Engineer, without cost to the Contractor. Acceptance tests will evaluate the homogeneity of the placed concrete. Tests will include gamma-gamma logging conducted in conformance with California Test 233. The Contractor shall not conduct operations within 8 meters of the gamma-gamma logging operations. The Contractor shall separate reinforcing steel as necessary to allow the Engineer access to the inspection pipes to perform gamma-gamma logging or other acceptance testing. After requesting acceptance tests and providing access to the piles, the Contractor shall allow 20 days for the Engineer to conduct these tests and make determination of acceptance. Should the Engineer fail to complete these tests within the time allowance, and if in the opinion of the Engineer, the Contractor's controlling operation is delayed or interfered with by reason of the

delay in inspection, the delay will be considered a right of way delay as specified in Section 8-1.09, "Right of Way Delays," of the Standard Specifications.

The Engineer may elect to perform additional tests to further evaluate a pile. These tests may include crosshole sonic logging and other means of inspection selected by the Engineer. When the Engineer elects to perform additional tests to further evaluate anomalies for a rejected pile, no time requirement exists for performing these tests. The Contractor may progress with the mitigation plan process without waiting for these supplemental results.

Inspection pipes and cored holes shall be dewatered and filled with grout after notification by the Engineer that the pile is acceptable. Grout shall conform to the provisions in Section 50-1.09, "Bonding and Grouting," of the Standard Specifications. Inspection pipes and holes shall be filled using grout tubes that extend to the bottom of the pipe or hole or into the grout already placed.

If acceptance testing performed by the Engineer determines that a pile does not meet the requirements of the specifications and California Test 233, Part 5C, then that pile will be rejected and all depositing of concrete under slurry or concrete placed using temporary casing for the purpose of controlling groundwater shall be suspended until written changes to the methods of pile construction are approved in writing by the Engineer.

The Engineer will determine whether the rejected pile requires mitigation due to structural, geotechnical, or corrosion concerns. The Engineer will consider the estimated size and location of the anomaly and potential effects upon the design. The Engineer will provide the conclusions of this analysis to the Contractor for development of a mitigation plan, if required. The Contractor shall allow 35 days for the Engineer to determine whether the pile requires mitigation and provide information to the Contractor. Day 1 of the 35 days shall be the first day after access has been provided to the Engineer to perform acceptance testing. If additional information is submitted to the Engineer that modifies the size, shape, or nature of the anomaly, the Contractor shall allow 15 additional days for the subsequent analysis.

If the Engineer determines that a rejected pile does not require mitigation, the Contractor may elect to 1) repair the pile per the approved mitigation plan, or 2) not repair anomalies found during acceptance testing of that pile. For such unrepaired piles, the Contractor shall pay to the State, \$400 per cubic meter for the portion of the pile affected by the anomalies. The volume, in cubic meter, of the portion of the pile affected by the anomalies, shall be calculated as the area of the cross section of the pile affected by each anomaly, in square meters, as determined by the Engineer, multiplied by the distance, in meters, from the top of each anomaly to the specified tip of the pile. If the volume calculated for one anomaly overlaps the volume calculated for additional anomalies within the pile, the calculated volume for the overlap shall only be counted once. In no case shall the amount of the payment to the State for any such pile be less than \$400. The Department may deduct the amount from any moneys due, or that may become due the Contractor under the contract.

If the Engineer determines that a rejected pile requires mitigation, the Contractor shall submit to the Engineer for approval a mitigation plan for repair, supplementation, or replacement for each rejected CIDH concrete pile conforming to the provisions in "Working Drawings," of these special provisions. If the Engineer determines that it is not feasible to repair the rejected pile, the Contractor shall not include repair as a means of mitigation and shall proceed with the submittal of a mitigation plan for replacement or supplementation of the rejected pile.

Pile mitigation plans shall include the following:

- A. The designation and location of the pile addressed by the mitigation plan.
- B. A review of the structural, geotechnical, and corrosion design requirements of the rejected pile.
- C. A step by step description of the mitigation work to be performed, including drawings if necessary.
- D. An assessment of how the proposed mitigation work will address the structural, geotechnical, and corrosion design requirements of the rejected pile.
- E. Methods for preservation or restoration of existing earthen materials.
- F. A list of affected facilities, if any, with methods and equipment for protection of these facilities during mitigation.
- G. The State assigned contract number, bridge number, full name of the structure as shown on the contract plans, District-County-Route-Kilopost, and the Contractor's (and Subcontractor's if applicable) name on each sheet.
- H. A list of materials, with quantity estimates, and personnel, with qualifications, to be used to perform the mitigation work.
- I. The seal and signature of an engineer who is licensed as a Civil Engineer by the State of California. This requirement is waived for approved mitigation plans when either of the following conditions are present:
  1. The proposed mitigation will be performed in conformance with the most recent Department approved version of "ADSC Standard Mitigation Plan 'A' - Basic Repair" without exception or modification.

2. The Engineer has determined that the rejected pile does not require mitigation due to structural, geotechnical, or corrosion concerns, and the Contractor elects to repair the pile using most recent Department approved version of "ADSC Standard Mitigation Plan 'B' - Grouting Repair" without exception or modification.

The most recent Department approved version of the "ADSC Standard Mitigation Plan" is available at:

<http://www.dot.ca.gov/hq/esc/geotech/ft/adscmitplan.htm>

For rejected piles to be repaired, the Contractor shall submit a pile mitigation plan that contains the following additional information:

- A. An assessment of the nature and size of the anomalies in the rejected pile.
- B. Provisions for access for additional pile testing if required by the Engineer.

For rejected piles to be replaced or supplemented, the Contractor shall submit a pile mitigation plan that contains the following additional information:

- A. The proposed location and size of additional piles.
- B. Structural details and calculations for any modification to the structure to accommodate the replacement or supplemental piles.

All provisions for CIDH concrete piling shall apply to replacement piles.

The Contractor shall allow the Engineer 20 days to review the mitigation plan after a complete submittal has been received.

Should the Engineer fail to review the complete pile mitigation submittal within the time specified, and if, in the opinion of the Engineer, the Contractor's controlling operation is delayed or interfered with by reason of the delay in reviewing the pile mitigation plan, an extension of time commensurate with the delay in completion of the work thus caused will be granted in conformance with the provisions in Section 8-1.09, "Right of Way Delays," of the Standard Specifications.

When repairs are performed, the Contractor shall submit a mitigation report to the Engineer within 10 days of completion of the repair. This report shall state exactly what repair work was performed and quantify the success of the repairs relative to the submitted mitigation plan. The mitigation report shall be stamped and signed by an engineer that is licensed as a Civil Engineer by the State of California. The mitigation report shall show the State assigned contract number, bridge number, full name of the structure as shown on the contract plans, District-County-Route-Kilopost, and the Contractor (and subcontractor if applicable) name on each sheet. The Engineer will be the sole judge as to whether a mitigation proposal is acceptable, the mitigation efforts are successful, and to whether additional repairs, removal and replacement, or construction of a supplemental foundation is required.

## **STEEL PIPE PILING**

### **GENERAL**

#### **Summary**

Steel pipe piling shall consist of unfilled steel pipe piling, steel shells for open and closed ended cast-in-steel-shell concrete piling, and permanent steel casing for cast-in-drilled-hole concrete piling. Steel pipe piling shall conform to the provisions in Section 49-5, "Steel Piles," of the Standard Specifications and these special provisions.

All steel pipe piling for this project shall be designated as Class R steel pipe piling.

#### **Submittals**

Steel pipe piling qualification audits shall be submitted in conformance with the provisions in "Steel Pipe Piling Qualification Audit" of these special provisions.

A Certificate of Compliance demonstrating material traceability shall be furnished in conformance with the provisions in Section 6-1.07, "Certificates of Compliance," of the Standard Specifications, and shall be signed by the facility's authorized Quality Control Representative. The Quality Control Representative shall be on record with the Department's Office of Structural Materials. The Certificate of Compliance shall include:

1. A statement that all materials and workmanship incorporated in the work and all required tests and inspections of this work have been performed in conformance with the details shown on the plans and these special provisions.

2. An attached certified mill test report (MTR) for each heat number of steel pipe piles being furnished.
3. The carbon equivalency (CE) calculated as  $CE = C + (Mn + Si)/6 + (Cr + Mo + V)/5 + (Ni + Cu)/15$ . The CE shall be 0.45% maximum and may be shown on the MTR.

The Contractor shall submit a TL-38 Inspection Request form at least:

1. 48 hours before performing any field welding of steel pipe piling.

The TL-38 Inspection Request form is available at:

<http://www.dot.ca.gov/hq/esc/Translab/OSM/smbforms.htm>

Working drawings shall be submitted to the Engineer before attaching handling devices to steel pipe piling. Working drawings shall include locations, handling and fitting device details, and connection details. Attachments shall not be made to steel pipe piling until the working drawings are approved in writing by the Engineer. The Contractor shall allow the Engineer 7 days for review.

## MATERIALS

### General

The provisions of "Welding Quality Control" of these special provisions shall not apply to longitudinal, skelp end, or spiral seam welds in steel pipe piling.

Circumferential welds shall conform to "Welding Quality Control" of these special provisions and the following:

1. Circumferential welds shall be complete joint penetration welds conforming to AWS D1.1.
2. Welds shall be located at least 300 mm away from a skelp end weld.
3. Backing rings shall conform to the following:
  - 3.1. The minimum thickness shall be 6 mm and the backing ring shall be continuous.
  - 3.2. Splices in the backing ring shall be made by complete joint penetration welds. These welds shall be completed and inspected, including any required nondestructive testing, before final insertion into a pipe end.
  - 3.3. The attachment of backing rings to pipe ends shall be done using the minimum size and spacing of tack welds that will securely hold the backing ring in place. Tack welding shall be done in the root area of the weld splice. Cracked tack welds shall be removed and replaced before subsequent weld passes.
  - 3.4. The gap between the backing ring and the steel pipe piling wall shall not be greater than 2 mm. One localized portion of the backing ring fit-up, that is equal to or less than a length that is 20 percent of the outside circumference of the pipe, as determined by the Engineer, may be offset by a gap equal to or less than 6 mm, provided that this localized portion is first seal welded using shielded metal arc E7016 or E7018 electrodes. This localized portion shall be marked so that it can be referenced during any required NDT.
  - 3.5. Backing rings shall have sufficient width so that the backing ring will not interfere with the interpretation of the NDT.
4. For steel pipe with an outside diameter greater than 1.1 m and with a wall thickness greater than 25.4 mm, the root opening tolerances may be increased to a maximum of 5 mm.
5. For welding limited to fit-up and attaching backing rings and handling devices, the preheat and interpass temperature shall be in conformance with the requirements in AWS D1.1, Section 3.5, "Minimum Preheat and Interpass Temperature Requirements," and with Table 3.2, Category C.

All steel pipe piling shall be capable of meeting the fit-up requirements of AWS D1.1, Section 5.22.3.1, "Girth Weld Alignment (Tubular)," when the material is spliced utilizing a girth weld.

For the purposes of welding and prequalification of base metal, steel pipe piling designated as ASTM A 252 shall be treated as ASTM A 572/A 572M, Grade 50, or ASTM A 709/A 709M, Grade 50, in conformance with the requirements in AWS D1.1, Table 3.1.

Butt welded seams subsequently formed, including skelp end welds, shall be 100 percent ultrasonically tested in the final formed and welded condition. The acceptance criteria for UT shall conform to API 5L for API-licensed facilities or AWS D1.1 for cyclically loaded nontubular connections for welds subject to tensile stress.

Except for tack welding, gas metal arc welding (GMAW) shall not be used for the welding of steel pipe piling. When GMAW is used for tack welding, the filler metal shall not be deposited by short circuiting transfer.

The dimensional tolerances of steel pipe piling shall conform to the following:

1. Outside diameter:  $\pm 0.75\%$  of the specified outside diameter
2. Wall thickness:  $-5\%$ ,  $+10\%$  of the specified nominal wall thickness
3. Straightness:  $\pm 1.0\%$  over the length of the pipe

Except for steel pipe piling marked with the API monogram, each length of steel pipe piling shall be marked as follows:

1. Name and location of the piling manufacturer
2. State Contract number
3. Heat number
4. Welding process
5. Outer diameter, nominal wall thickness, minimum wall thickness, and length
6. Year piling was produced
7. Marked as specified below for each class of steel pipe piling. Only Caltrans audited facilities are approved to mark piling for use on this project.

### **Class R Steel Pipe Piling**

Class R steel pipe piling shall conform to one of the following:

1. Manufactured, welded, tested, and inspected in conformance with API 5L, minimum Grade X52, PSL1, and the following:
  - 1.1. Steel pipe piling shall be manufactured by a facility licensed to apply the API monogram.
  - 1.2. Hydrostatic testing, flattening tests, and the API monogram will not be required.
  - 1.3. Each length shall be marked "Caltrans Class R - API."
2. Manufactured in conformance with ASTM A 252, Grade 3, and the following:
  - 2.1. Arc welding processes shall conform to AWS D1.1.
  - 2.2. Groove welds using submerged arc welding from both sides without backgouging will require a procedure qualification record witnessed by the Engineer.
  - 2.3. Underfill will not be allowed.
  - 2.4. For electric resistance welded pipe, the outer diameter flash shall be removed to a maximum of 0.76 mm.
  - 2.5. The weld reinforcement shall not exceed 3 mm.
  - 2.6. The weighing of individual pipe will not be required as specified in ASTM A 252.
  - 2.7. Each length shall be marked "Caltrans Class R - A 252."

## **CONSTRUCTION**

### **General**

Steel pipe piling may be re-tapped to prevent pile set-up provided the field welded splice remains at least 1 meter above the work platform until that splice is approved in writing by the Engineer.

Welds used to attach handling devices to steel pipe piling shall be aligned parallel to the axis of the pile and shall conform to the requirements for field welding specified herein. Permanent bolted connections shall be corrosion resistant.

### **Field Welding**

Field welding of steel pipe piling is defined as welding performed after the material has been transported from an audited facility.

Field welding shall conform to the requirements for circumferential welds as specified in "Materials" of this section and the following:

1. Welds made in the horizontal position where the longitudinal pipe axis is vertical shall be single-bevel groove welds.
2. The minimum preheat and interpass temperature for splice welding and for making repairs shall be 66°C, regardless of the pipe wall thickness or steel grade. In the event welding is disrupted, preheating to 66°C shall occur before welding is resumed.
3. Welds shall not be water quenched. Welds shall be allowed to cool unassisted to ambient temperature.

### **STEEL SOLDIER PILING**

This work at Retaining Wall No. 51 shall consist of furnishing and installing steel piling; cleaning and preparing portions of the pile for splicing; splicing steel piles; securing the piling prior to and during concrete encasement; shaping the tops of the piles; cleaning and preparing portions of the pile for welding anchor studs; and furnishing, cleaning and welding anchor studs to piling in accordance with the details shown on the plans, and these special provisions.

Adjacent soldier piles shall not be constructed concurrently.

The Contractor shall adjust the locations of Pile No. 28 through 32 to avoid interference of tiebacks with existing abandoned steel pipe piles as noted on the plans.

The Contractor shall submit to the Engineer working drawings, including design calculations, for construction of soldier pile (Pile No 28 through 32) in conformance with the provisions in "Working Drawings," of these special provisions. The drawings and calculations shall be signed by an engineer who is registered as a Civil Engineer in the State of California. One set of the drawings and one copy of the design calculations, shall be furnished to the Engineer.

The Contractor shall allow three weeks after complete drawings and calculations are submitted for the review and approval of the Soldier Pile No 28 through 32 construction. No construction of Pile No 28 through 32 shall be performed until the working drawings and calculations are approved in writing by the Engineer.

The working drawing submittal shall include, but not be limited to, the following:

- A. The new layouts of Pile No 28 through 32.
- B. Proposed methods of excavation and removal of materials between existing abandoned steel pipe piles.
- C. Proposed methods of backfilling and backfill materials behind soldier pile wall.
- D. Proposed methods of backfilling and backfill materials to be used in the void among abandoned steel pipe piles.
- E. List of all the equipments used in the work.

### **Materials**

Anchor studs shall conform to the provisions for stud connectors in Section 55, "Steel Structures," of the Standard Specifications and these special provisions.

Stud connectors shall be Type B as defined in AWS D1.5, Section 7.

Expanded polystyrene must comply with Section 51-1.12D, "Sheet Packing, Preformed Pads, and Board Fillers," of the Standard Specifications.

Elastomeric bearing pads shall conform to the provisions in Section 51-1.12H, "Elastomeric Bearing Pads," of the Standard Specifications.

### **Construction**

Steel soldier piles shall be placed in a drilled hole and shall be plumbed and aligned before placing concrete backfill. Alignment shall be maintained while placing backfill material in the drilled holes.

Cleaning and preparing the pile shall be performed in heat affected areas before splicing steel piles or welding stud type shear connectors.

### **MEASUREMENT AND PAYMENT (PILING)**

Measurement and payment for the various types and classes of piles shall conform to the provisions in Sections 49-6.01, "Measurement," and 49-6.02, "Payment," of the Standard Specifications and these special provisions.

Payment for cast-in-place concrete piling shall conform to the provisions in Section 49-6.02, "Payment," of the Standard Specifications and these special provisions except that when the diameter of cast-in-place concrete piling is shown on the plans as 600 mm or larger, reinforcement in the piling will be paid for by the kilogram as bar reinforcing steel (bridge).

Full compensation for slurry, depositing concrete under slurry, test batches, inspection pipes, filling inspection holes and pipes with grout, drilling oversized cast-in-drilled-hole concrete piling, filling cave-ins and oversized piles

with concrete, and redrilling through concrete shall be considered as included in the contract prices paid per meter for cast-in-drilled-hole concrete piling of the types and sizes listed in the Engineer's Estimate (except cast-in-drilled-hole concrete pile foundations specified in "Signal, Lighting and Electrical System," of these special provisions) and no additional compensation will be allowed therefor.

The contract price paid per meter for permanent steel casing of the sizes listed in the Engineer's Estimate shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in furnishing and installing permanent steel casing, complete in place, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

Full compensation for conforming to the provisions in "Steel Pipe Piling" of these special provisions shall be considered as included in the contract prices paid for the various items of work involved, and no additional compensation will be allowed therefor.

The contract price paid per meter for steel soldier pile of the types shown in the Engineer's Estimate shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in furnishing and installing the steel soldier piles at the site to the required depth, including securing the piling to maintain accurate alignment prior to and during encasing the pile with concrete, shaping pile tops, furnishing and welding plates at top of the steel soldier piles, furnishing and welding stay plates to the soldier piles, cleaning and preparing heat affected areas of piles for splicing and welding anchor studs to the piles, and splicing steel soldier piles, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

Full compensation for driving system submittals shall be considered as included in the contract unit price paid for drive pile, and no additional compensation will be allowed therefor.

Full compensation for epoxy coated anchor reinforcement at pileheads shall be considered as included in the contract price paid per meter for furnish steel piling of the types shown in the Engineer's Estimate and no separate payment will be made therefor.

Full compensation for providing special tips, heavier sections, or for subexcavating, predrilling, coring, spudding or employing other measures to prevent damage to the piles shall be considered as included in the contract unit price paid for drive pile of the sizes shown in the Engineer's Estimate, and no additional compensation will be allowed therefor.

Full compensation for submitting working drawings for Soldier Pile No 28 through 32, furnishing and installing expanded polystyrene and elastomeric bearing pads to the soldier piles, as shown on the plans, shall be considered as included in the contract price paid per meter for steel soldier pile of the types shown in the Engineer's Estimate and no additional compensation will be allowed therefor.

#### **10-1.89 DRILLED HOLES**

Holes for steel soldier piles shall be drilled into natural foundation materials at the location shown on the plans and shall conform to the provisions in Section 49, "Piling," of the Standard Specifications and these special provisions.

Foundation recommendations are included in "Supplemental Project Information," of these special provisions as Information Handout available to the Contractor in conformance with the provisions in Section 2-1.03, "Examination of Plans, Specifications, Contract, and Site of Work," of the Standard Specifications.

Drilled holes shall be accurately located and shall be straight and true. When the piles are plumbed and aligned, the steel piles shall be at least 75 mm clear of the sides of the hole for the full length of the hole to be filled with concrete backfill. Holes which do not provide the clearance around steel piles shall be reamed or enlarged at the Contractor's expense.

Temporary casings or tremie seals shall be furnished and placed where necessary to control water or to prevent caving of the hole.

Difficult drilling is anticipated due to the presence of caving soils, hazardous and contaminated materials, sound control, and vibration monitoring.

Loose materials existing at the bottom of the hole after drilling operations have been completed shall be removed before placing the pile.

Materials resulting from drilling holes shall be disposed of in conformance with the provisions in Section 19-2.06, "Surplus Material," of the Standard Specifications, except contaminated materials resulting from drilling holes within the contaminated area as shown on the plans shall be disposed of in conformance with the provisions in "Handling, Transportation, and Disposal of Contaminated Material," of these special provisions.

Drilling mud or chemical stabilizers shall not be used. Surface water shall not be permitted to enter the hole and all water in the hole shall be removed before placing concrete therein.

Casing, if used in drilling operations, shall be removed from the hole as concrete is placed therein. The bottom of the casing shall be maintained not less than 1500 mm below the top of the concrete during casing withdrawal and concrete placing operations. Separation of the concrete during withdrawal operations shall be avoided by



hammering or otherwise vibrating the casing. The methods used to withdraw temporary casings shall preclude contamination of the concrete and commingling of the soil and concrete or of any ground water and concrete.

The contract price paid per meter for drilled hole of the diameter shown on the plans shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals and for doing all the work involved in drilling holes for soldier piles, including disposing of the material resulting from drilled holes, casing holes and removing casing, and providing tremie seals, complete in place, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

#### **10-1.90 PRESTRESSING CONCRETE**

Prestressing concrete shall conform to the provisions in Section 50, "Prestressing Concrete," of the Standard Specifications and these special provisions.

The prestressing sequence shall conform to the requirements shown on the plans.

Prestressing high strength rods for bikepath at Pier W2 will be included in the contract price paid for erect State furnished bikepath.

The details shown on the plans for cast-in-place prestressed box girder bridges are based on a bonded full length draped tendon prestressing system. For these bridges the Contractor may, in conformance with the provisions in Section 5-1.14, "Cost Reduction Incentive," of the Standard Specifications, propose an alternative prestressing system utilizing bonded partial length tendons provided the proposed system and associated details meet the following requirements:

- A. The proposed system and details shall provide moment and shear resistances at least equal to those used for the design of the structure shown on the plans and the Contractor shall demonstrate that tensile cracking will not be induced in the structure at the termination points of partial length tendons.
- B. The concrete strength shall not be less than that shown on the plans.
- C. Not less than 35 percent of the total prestressing force at any section shall be provided by full length draped tendons.
- D. Anchorage blocks for partial length tendons shall be located so that the blocks will not interfere with the placement of the utility facilities shown on the plans or of any future utilities to be placed through openings shown on the plans.
- E. Temporary prestressing tendons, if used, shall be detensioned, and the temporary ducts shall be filled with grout before completion of the work. Temporary tendons shall be either removed or fully encased in grout before completion of the work.
- F. All details of the proposed system, including supporting checked calculations, shall be included in the drawings submitted in conformance with "Working Drawings" of these special provisions. Calculations and working drawings shall be stamped by an engineer who is registered as a Civil Engineer in the State of California.

The contract lump sum price paid for prestressing concrete of the types listed in Engineer's Estimate shall include full compensation for furnishing all labor, materials, tools, equipment and incidentals, and for doing all work involved in furnishing, placing and tensioning the prestressing in cast-in-place concrete structure, complete in place, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

#### **10-1.91 TIEBACK ANCHORS**

Anchors at the Retaining Wall No. 51, consisting of holes drilled in foundation material, grouted steel strands, and anchorage assemblies, and testing of installed anchors shall conform to the details shown on the plans, the provisions in Section 50, "Prestressing Concrete," of the Standard Specifications, and these special provisions.

Foundation recommendations are included in "Supplemental Project Information," of these special provisions available to the Contractor in conformance with the provisions in Section 2-1.03, "Examination of Plans, Specifications, Contract, and Site of Work," of the Standard Specifications.

Difficult tieback installation is anticipated due to the presence of caving soils, hazardous and contaminated materials, existing abandoned steel pipe piles, sound control, and vibration monitoring.

The Contractor shall determine the bond length necessary to meet acceptance criteria specified herein.

The submittal of reduced prints of corrected original tracings will not be required for tieback anchor installations.

In fabricating, handling, shipping, and placing tieback anchors, adequate care shall be taken to avoid damage to the sheathing. Damage to the sheathing caused by handling and fabrication prior to tieback anchor installation shall

be repaired or replaced as determined by the Engineer. Repair procedure for the sheathing shall be included in the working drawings.

The Contractor may submit, for approval by the Engineer and in conformance with the provisions in "Working Drawings," of these special provisions, calculations and details for furnishing an alternative number of tiebacks that provide the same horizontal component and distribution of the design force as provided by the planned tiebacks. Alternative wall details shall be furnished, for approval by the Engineer, if the number of tiebacks is reduced. Alternative design calculations and details shall be signed by an engineer who is licensed as a Civil Engineer in the State of California.

## **MATERIALS**

Whenever "member" is referred to in Section 50, "Prestressing Concrete," of the Standard Specifications, it shall be considered to mean tieback anchor.

Structural steel for the tieback retaining wall shall conform to the provisions in Section 55, "Steel Structures," of the Standard Specifications and these special provisions. Structural steel shall consist of the anchorage assembly. The provisions of "Welding Quality Control" of these special provisions shall not apply to the weld between the steel tube and the bearing plate of the anchorage assembly for tiebacks. Those provisions shall apply to all other welds of structural steel for tieback retaining walls.

Cleaning and painting structural steel for tieback retaining walls shall conform to the provisions in "Clean and Paint Steel Soldier Piling" of these special provisions.

The permanent bearing plate of the tieback anchor shall effectively distribute the design force (T) to the soldier piles and the bending stress does not exceed  $0.55 f_y$  for steel nor  $0.36 f_y$  for cast steel or cast iron.

Grout shall conform to the provisions in Section 50-1.09, "Bonding and Grouting," of the Standard Specifications. Fine aggregate may be added to the grout mixture of portland cement and water used outside of the grouted sheathing in drilled holes which are 200 mm or greater in diameter, but only to the extent that the cement content of the grout is not less than 500 kg per cubic meter of grout. Fine aggregate, if used, shall conform to the provisions in Section 90-2, "Materials," and Section 90-3, "Aggregate Gradings," of the Standard Specifications.

The plastic sheathing for tieback anchors shall conform to one of the following: polyvinyl chloride (PVC) sheathing, high density polyethylene (HDPE) sheathing, or polypropylene sheathing.

Corrugated plastic sheathing shall be PVC or HDPE. The width of corrugations, the distance between corrugations, and the height of corrugations of corrugated plastic sheathing shall be approximately the same.

PVC sheathing may be used for corrugated sheathing. PVC sheathing shall conform to ASTM Designation: D 1784, Class 13464-B. Corrugated PVC sheathing shall have a nominal wall thickness of 1.0 mm. HDPE sheathing may be used for corrugated sheathing. HDPE sheathing shall have a density between  $940 \text{ kg/m}^3$  and  $960 \text{ kg/m}^3$  as measured in accordance with ASTM Designation: D 792, A-2. Corrugated HDPE sheathing shall have a nominal wall thickness of 1.5 mm for sheathing with an outside diameter of 75 mm or greater, and a nominal thickness of 1.0 mm for sheathing with an outside diameter less than 75 mm, with a tolerance of minus 0.25-mm.

HDPE sheathing may be used for the smooth sheathing encapsulating individual strands of strand type tendons. Smooth HDPE sheathing for encapsulating strands shall have a minimum wall thickness of 1.0 mm. Polypropylene sheathing may be used for the smooth plastic sheathing encapsulating individual strands of strand type tendons. Polypropylene sheathing shall have a density between  $900 \text{ kg/m}^3$  and  $910 \text{ kg/m}^3$ . Smooth polypropylene sheathing shall have a minimum wall thickness of 1.0 mm.

The smooth sheathing for the unbonded length of the individual strands shall have sufficient strength to prevent damage during construction operations and shall be watertight, chemically stable without embrittlement or softening, and nonreactive with concrete, steel, or corrosion inhibiting grease. Smooth plastic sheathing, including joints, shall be watertight.

The corrugated sheathing, including joints, shall have sufficient strength to prevent damage during construction operations and shall be grout-tight and watertight, chemically stable without embrittlement or softening, and nonreactive with concrete, steel, or corrosion inhibiting grease.

The transition between the corrugated plastic sheathing and the anchorage assembly shall be an approved detail that allows stressing to the design force without evidence of distress in the corrugated plastic sheathing.

Additional requirements for tiebacks with strand type tendons are as follows:

- A. The individual strands of a tendon, except for the bonded length, shall be fully coated with corrosion inhibiting grease and then encapsulated by a smooth HDPE or polypropylene sheath. The corrosion inhibiting grease shall fill all space between strand wires and shall encapsulate the strand giving an encasement diameter at least 0.12-mm greater than the diameter of the bare strand. The sheath shall be hot

- melt extruded onto the strand or shall be shop applied by an approved method that assures that all spaces between the sheath and the strand and between the strand wires are filled with corrosion inhibiting grease.
- B. The corrosion inhibiting grease shall provide a continuous nonbrittle film of corrosion protection to the prestressing steel and lubrication between the strand and the sheathing, shall resist flow from the sheathing, shall be chemically stable and nonreactive with the prestressing steel, sheathing material, and concrete, and shall be organic with appropriate polar, moisture displacing, and corrosion inhibiting additives.
- C. The corrosion inhibiting grease shall have the physical properties listed in Table 3.2.1 of the Post Tensioning Manual, Fourth Edition, by the Post Tensioning Institute and as modified below. At least 40 days before use, a sample from the lot to be used and test results shall be provided for the corrosion inhibiting grease.

Test	Requirements	ASTM Designation:
Water Soluble Ions: Nitrates	10 ppm max.	D 3867
Corrosion Test: 5% Salt Fog @ 38° C. 125 µm coating on 76 mm x 152 mm Q panel Type S, 1000 hrs min.	Grade 7 or better	B 117, D 610
Compatibility with sheathing: Hardness change & volume change of polymer after exposure to grease 40 days at 66° C.	15% max. 10% max.	D 4289, except use D 792 for density

## CONSTRUCTION

Tieback anchors shall be installed in accordance with the manufacturer's recommendations. In case of a conflict between the manufacturer's recommendations and these special provisions, these special provisions shall prevail.

Water and grout from tieback anchor construction operations shall not be permitted to fall on public traffic, to flow across shoulders or lanes occupied by public traffic, or to flow into landscaping, gutters, or other drainage facilities. Excessive amounts of water shall not be used in any of the drilling and the tieback anchor installation procedures.

Tieback anchor steel shall be protected prior to completion of all grouting against rust, corrosion and physical damage in conformance with the provisions in Section 50, "Prestressing Concrete," of the Standard Specifications. In addition, there shall be no evidence of distress in the plastic sheathing or crushing of the cement grout within the pregrouted sheathing.

The tieback anchorage assembly shall be protected against rust, corrosion, and physical damage prior to completion of all grouting of enclosure or encasement in concrete.

The tieback anchor installation method selected by the Contractor shall be sufficient to achieve the loadings specified herein. Holes for tieback anchors shall be drilled in the foundation to a depth sufficient to provide the necessary bond length beyond the minimum unbonded length shown on the plans.

Tieback anchorage holes shall be drilled by either the rotary or rotary percussion drilling method.

The diameter of the drilled hole shall be large enough to provide a minimum of 75 mm grout cover within the bonded length of the tendon. Centralizers shall be used within the bonded length of the tendon.

Pregrouting shall occur at least 48 hours before placing the tendon in the drilled hole.

Prior to installing each anchor assembly into the drilled hole, the anchor assembly shall be clean and free of oil, grease, or other extraneous substances, and any damage to the sheathing shall be repaired or replaced.

Grout for all stages of tieback construction shall be injected at the low end of the void being filled and shall be expelled at the high end until there is no evidence of entrapped air, water, or diluted grout. The grout shall be placed using grout tubes, unless another method is approved by the Engineer. The quantity of the grout and the grout pressures shall be recorded.

After placing initial grout, the anchor shall remain undisturbed until the grout has reached a strength sufficient to provide anchorage during testing operations.

Additional requirements for tiebacks with strand type tendons are as follows:

- A. The Contractor shall have the option of using Alternative A or Alternative B as shown on the plans for tieback tendons.
- B. For Alternative A and Alternative B, strand tendons shall be sheathed with corrugated sheathing. The individual strands within the bonded length shall be separated by spaces so that the entire surface of each strand is bonded in the grout. The maximum spacing of strand spacers shall be 1.50 m. The strand spacers shall be plastic and of a construction and strength that will provide support for the individual strands during construction operations.
- C. For Alternative A, the bonded length of the tendon shall be sheathed with corrugated sheathing and pregrouted full length of the corrugated sheathing before placing the tendon in the hole. The corrugated sheathing shall lap the smooth sheathing on the strands 600 mm. For this alternative, the initial grout in the drilled hole may be placed before or after insertion of the strand tendon.
- D. For Alternative B, the tendon shall be sheathed full length with corrugated sheathing and pregrouted a minimum length of 600 mm before placing the tendon in the hole. After placing the tendon into the drilled hole and before placing initial grout in the drilled hole, the grout shall be injected at the low end of the corrugated sheathing and the grout shall be expelled at the high end until there is no evidence of entrapped air, water, or diluted grout.
- E. For Alternative A and Alternative B, anchors in holes of 150 mm diameter and smaller shall be initially grouted to within 150 mm of the end of the steel tube. Grout in the unbonded length shall not be placed under pressure. After placing the initial grout, the anchor shall remain undisturbed until the grout has reached a strength sufficient to provide anchorage during testing operations.
- F. For Alternative A and Alternative B, anchors in holes of greater than 150 mm diameter shall be initially grouted within the bond length. After placing the initial grout, the anchor shall remain undisturbed until the grout has reached a strength sufficient to provide anchorage during testing operations.

### **Testing**

All tiebacks shall be load tested by either a performance test or a proof test. Load testing shall be performed against soldier piles. Bearing pads shall be kept a minimum of 300 mm away from the edges of the drilled hole. The magnitude of applied test loads shall be determined with a calibrated pressure gauge or a load cell. Movements of the end of the tieback, relative to an independent fixed reference point, shall be measured and recorded to the nearest 0.025 mm at each load increment during the load tests. The Contractor shall perform the measuring and recording and shall furnish the Engineer copies of the recorded movements.

A minimum of 10 tiebacks shall be performance tested. The Engineer shall determine the location of the tiebacks to be performance tested.

The performance test or proof test shall be conducted by measuring the test load applied to the tieback and the tieback end movement during incremental loading and unloading of the anchor in accordance with the loading schedule. The test load shall be held constant for 10 minutes. During the test load hold, the movement of the end of the tendon shall be measured at 1, 2, 3, 4, 5, 6, and 10 minutes. If the total movement between one minute and 10 minutes exceeds one mm, the test load shall be held for an additional 50 minutes. Total movement shall be measured at 15, 20, 25, 30, 45, and 60 minutes. If the test load is held for 60 minutes, a creep curve showing the creep movement between one minute and 60 minutes shall be plotted as a function of the logarithm of time.

LOADING SCHEDULES		
PERFORMANCE TEST		PROOF TEST
	(CONT'D)	
AL	AL	AL
0.25T	0.25T	0.25T
AL	0.50T	0.50T
0.25T	0.75T	0.75T
0.50T	1.00T	1.00T
AL	1.25T	1.25T
0.25T	AL	1.50T (TEST LOAD)
0.50T	0.25T	AL
0.75T	0.50T	
AL	0.75T	
0.25T	1.00T	
0.50T	1.25T	
0.75T	1.50T (TEST LOAD)	
1.00T (CONT'D)	AL	
T = Design force for the anchor shown on the plans		
AL = Alignment load		

For performance and proof tests, each increment of load shall be applied in less than one minute and held for at least one minute but not more than 2 minutes or as specified above. The observation period for the load hold shall start when the pump begins to apply the last increment of load.

The jacking equipment, including the tendon movement measuring system, shall be stable during all phases of the tieback loading operations.

All tiebacks not performance tested shall be proof tested. If 1.5 times the design force cannot be obtained, the tieback shall be redesigned and replaced. Tieback anchors shall not be retested, unless the tieback bond length is post-grouted after the unacceptable test.

A performance tested tieback is acceptable if:

- A. The measured elastic movement exceeds 0.80 of the theoretical elongation of the unbonded length plus the jacking length at the maximum test load; and
- B. The creep movement between one and 10 minutes is less than 1.0 mm.

A proof tested tieback is acceptable if:

- A. The pattern of movements is similar to that of adjacent performance tested tiebacks; and
- B. The creep movement between one and 10 minutes is less than 1.0 mm.

Performance tested or proof tested tiebacks which fail to meet acceptance criterion B will be acceptable if the maximum load is held for 60 minutes and the creep curve plotted from the movement data indicates a creep rate of less than 2.0 mm for the last log cycle of time.

### Lock-off

After successful testing of the tiebacks, the tiebacks shall be tensioned against the structure and locked off at a load equal to 0.75T. The lock-off force is the load on the jacks which is maintained while the anchor head or anchor nuts on the tieback are permanently set. Immediately after lock-off, a lift-off test shall be performed to demonstrate that the specified lock-off force was obtained. Adjustments in the shim thickness shall be made if required to maintain the specified lock-off force.

For strand tendons, the permanent wedges shall be fully set in the anchor head while the tendon is stressed to the test load of 1.50 T, and then locked off at the lock-off force by removal of the shims or other appropriate means.

Grouting to the level of secondary grouting to the dimensions shown on the plans shall be completed only after successful testing and lock-off has been completed. At least 24 hours after the secondary grout has set, the remaining void in the steel tube and bearing plate shall be filled with grout. Grout shall be injected at the low end and expelled at the high end until there is no evidence of entrapped air or water. A minimum grout head of 600 mm shall be maintained until the grout has set.

## **MEASUREMENT AND PAYMENT**

No payment will be made for tiebacks which do not pass the specified testing requirements.

Tieback anchors will be measured and paid for by the unit, and the number for payment will be determined by the requirements of the details shown on the plans. No change in the number of tieback anchors to be paid for will be made because of the use by the Contractor of an alternative number of tiebacks.

The contract unit price paid for tieback anchor shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in constructing the tieback anchors, including special measures taken to contain grout in the drilled hole, testing, and furnishing and installing anchorage assemblies, complete in place, including repair or replacement of sheathing as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

### **10-1.92 GROUTING**

Grout for grouting the hole at column pipe keys shall conform to the provisions in Section 50-1.09, "Bonding and Grouting," of the Standard Specifications, the details shown on the plans and these special provisions.

The Contractor shall ensure that the area to be grouted is completely filled with grout without voids.

Full compensation for grouting pipe keys as shown on the plans shall be considered as included in the contract price paid per cubic meter for structural concrete, bridge and no separate payment will be made therefor.

### **10-1.93 CONCRETE STRUCTURES**

Portland cement concrete structures shall conform to the provisions in Section 51, "Concrete Structures," of the Standard Specifications and these special provisions.

Replace paragraphs 2 through 4, Section 51-1.13, "Bonding," of the Standard Specifications with the following:

Surfaces of fresh concrete at horizontal construction joints shall be thoroughly consolidated without completely removing surface irregularities. Additionally, surfaces of fresh concrete at horizontal construction joints between girder stems and decks shall be roughened to at least a 6 mm amplitude.

Construction joint surfaces shall be cleaned of surface laitance, curing compound, and other foreign materials using abrasive blast methods before fresh concrete is placed against the joint surface.

Construction joint surfaces shall be flushed with water and allowed to dry to a surface dry condition immediately before placing concrete.

Attention is directed to "Precast Concrete Quality Control" of these special provisions.

Shotcrete shall not be used as an alternative construction method for reinforced concrete members unless otherwise specified.

When a roughened concrete surface is shown on the plans, the existing concrete surface shall be roughened to a full amplitude of approximately 6 mm by abrasive blasting, water blasting, or mechanical equipment.

Neoprene strip shall be furnished and installed at abutment backwall joint protection in conformance with the details shown on the plans, the provisions in the Standard Specifications, and these special provisions.

Furnishing and installing neoprene strip shall conform to the requirements for strip waterstops as provided in Section 51-1.145, "Strip Waterstops," of the Standard Specifications, except that the protective board will not be required.

Forms used to support the deck of cast-in-place box girders may remain in place, provided the forming system employed leaves no sharp projections into the cells or voids, and the portions of the forms in cells containing utility facilities are removed completely from the cells. The forms between hinges and 1.5 m beyond access openings adjacent to hinges shall be removed.

Surfaces to receive Class 1 finish in conformance with section 51-1.18B, "Class 1 Surface Finish," of the Standard Specifications shall include undersurfaces of box girder spans.

Materials for access opening covers in soffits of new cast-in-place concrete box girder bridges shall conform to the provisions for materials in Section 75-1.03, "Miscellaneous Bridge Metal," of the Standard Specifications.

Plastic pipe located at vertical drains used behind retaining walls, including horizontal or sloping drains down slopes and across sidewalk areas, shall be polyvinyl chloride (PVC) plastic pipe, Schedule 80, conforming to the provisions for pipe for edge drains and edge drain outlets in Section 68-3.02, "Materials," of the Standard Specifications. The vertical drain pipe shall be rigidly supported in place during backfilling operations.

The Contractor shall provide adequate temporary bridging at existing hinges W8B and W6RB to accommodate deck smoothness testing and grinding across the hinges. Smoothness testing of existing deck surfaces will be performed by the Engineer. Grinding shall be done as directed by the Engineer and will be paid for as extra work as provided in Section 4-1.03D, "Extra Work," of the Standard Specifications.

## **DECK CRACK TREATMENT**

Deck crack treatment shall be in conformance with the requirements of Section 51-1.17A "Deck Crack Treatment" of the Standard Specifications.

## **DECK SURFACE TEXTURE**

Attention is directed to Section 51-1.17, "Finishing Bridge Decks," of the Standard Specifications.

New bridge deck surfaces shall be textured by grooving.

Grooves shall be made parallel to the centerline of the traffic lane and shall be within 150 mm from the layout line of the toe of the concrete barrier.

Grooving of the concrete deck surface shall conform to one of the following methods:

- A. Grooving operations shall conform to the requirements in Section 42-1, "Grooving," of the Standard Specifications.
- B. Grooves shall be made with spring steel tines. Spring steel tines of the final texturing device shall be rectangular in cross section, 2 mm to 4 mm wide, on 19 mm to 24 mm centers, and of sufficient length, thickness and resilience to form grooves approximately 5 mm deep in the fresh concrete surface. Final texture shall be uniform in appearance and longitudinal grooves shall have a depth between 2 mm and 8 mm.

Grooving shall be done in such a manner as to prevent the texture device from tearing the surface or causing the visible separation of coarse aggregate at the surface.

The aggregate grading of concrete for footings, columns, bent caps and hinges shall be the 12.5 mm maximum combined aggregate grading and shall conform to the requirements in Section 90-3, "Aggregate Gradings," of the Standard Specifications.

## **SELF-CONSOLIDATING CONCRETE**

Self-consolidating concrete shall be flowing concrete capable of spreading without segregation to a level state without the use of internal or external vibrators. Self-consolidating concrete shall conform to "Concrete Structures" of these special provisions and the requirements specified herein.

Concrete Type 2 shown on YBI Edge Beam Support Structure plans shall be vibrated within 200 mm of the hinge seat along the entire length of the hinge seat.

In addition to the chemical admixtures listed on the Department's current list of approved brands of admixtures that may be used, the Contractor may use a viscosity modifying admixture made by a chemical admixture manufacturer for the purpose of producing a self-consolidating concrete. The use of the viscosity modifying admixture shall be in accordance with the manufacturer's recommendations. The combined aggregate grading shall be any of the four maximum size grading limits specified in Section 90-3.04, "Combined Aggregate Gradings," of the Standard Specifications.

The Contractor's proposed mix design shall be pre-qualified for use by trial batch reports in conformance with Section 90-9 "Compressive Strength," of the Standard Specifications except that the consistency shall be measured by the slump flow test and bleeding shall be measured by ASTM Designation, C 232, Method A. The slump flow test shall conform to the requirements in ASTM Designation: C 143 except the following:

- A. The cone shall be filled in one lift without rodding. The cone shall be placed on a flat, moist, nonabsorbent, rigid base plate that is at least 700mm x 700 mm. The base plate shall have concentric circle marks showing 200-mm and 500-mm diameter circles.
- B. Measure the time it takes for the concrete to reach 500 mm diameter circle. Report this as "Slump Flow Time" to the nearest 0.5 seconds.
- C. After the concrete ceases to flow, measure the diameter in two perpendicular directions. Report this as "Slump Flow" to the nearest 5 mm.
- D. Visually inspect the concrete spread to observe the distribution of coarse aggregate throughout the spread. Measure and record the radial width of any mortar ring without coarse aggregate. If no mortar ring without coarse aggregate exists, report as zero.

Consistency of the self-consolidating concrete shall be determined using the slump flow test method. The self-consolidating concrete shall have a minimum slump flow of 550 mm without segregation except that Concrete Type 2 shown on YBI Edge Beam Support Structure plans shall have a minimum slump flow of 700 mm without

segregation. The slump flow shall be selected by the Contractor based on the concrete constituent materials and placement procedures as specified in the approved working drawings.

The percent bleeding shall not exceed 1.5% when determined by ASTM Designation, C 232, Method A except that the container shall be filled in one lift without rodding.

At the option of the Contractor, Type III cement and Type C accelerating chemical admixtures conforming to the provisions in Section 90-4, "Admixtures," of the Standard Specifications may be used for Concrete Type 2 shown on YBI Edge Beam Support Structure plans.

Alternatively, at the option of the Contractor, concrete conforming to the requirements of Fast Setting Hydraulic Cement Concrete may be used for Concrete Type 2 shown on YBI Edge Beam Support plans.

#### **Fast Setting Hydraulic Cement Concrete**

Fast Setting Hydraulic Cement Concrete (FSHCC) shall consist of hydraulic cement, conforming to the requirements below, aggregate, and any admixtures used. The combined aggregate grading used in FSHCC shall be any of the maximum size grading limits specified in Section 90-3.04, "Combined Aggregate Gradings," of the Standard Specifications. The minimum 3 hour compressive strength shall be 14 MPa and the minimum 56 day compressive strength shall be 35 MPa.

FSHCC shall conform to the provisions in Section 90, "Portland Cement Concrete," of the Standard Specifications, except that any cement meeting the requirements specified in ASTM Designation: C 219 and conforming to the following requirements may be used.

TEST DESCRIPTION	REQUIREMENT	TEST METHOD
Contraction in Air	0.053 %, max.	California Test 527, W/C Ratio = $0.39 \pm 0.010$
Mortar Expansion in Water	0.04 %, max.	ASTM Designation: C 1038
Soluble Chloride*	0.05 %, max.	California Test 422
Soluble Sulfates*	0.30 %, max.	California Test 417
Thermal Stability	90 %, min.	California Test 553
Compressive Strength @ 3 days	17 MPa	ASTM Designation: C 109

\*Test is to be done on a cube specimen, fabricated in conformance with the requirements in ASTM Designation: C 109, cured at least 14 days and then pulverized to 100% passing the 300- $\mu$ m sieve

FSHCC shall be proportioned and placed by volumetric continuous mixers capable of proportioning cement, water, aggregate and admixtures by volume. Identifying numbers or letters of volumetric continuous mixers shall be located on the front or rear of the equipment. Calibration of the volumetric continuous mixers shall be performed demonstrating that the equipment is capable of delivering the proportioned concrete material per the approved mix design. The volumetric continuous mixers shall produce a log of production data, at no less than 20 minute intervals, showing the proportions of cement, aggregate and water dispatched.

The Contractor shall furnish aggregate moisture determinations per California Test Method 223. During actual placement the percent fine aggregate moisture content to be used shall be limited to a maximum value of 2% more than moisture content determined during calibration.

The aggregate and cement proportioning calibrations shall be determined by weight.

The first 3 volumetric continuous mixers to be used during actual production at the site shall be loaded with all material at least 4 hours prior to placement. A trial mix to be disposed of by the Contractor shall be batched for the Engineer's inspection. The mix size shall be from a minimum 20 second operation of the mixer. At 3 hours after discharge the batched material shall be visibly hard indicating at least a final set.

After the calibration and acceptance of the use of a volumetric continuous mixer, water to account for any allowable change in fine aggregate moisture content may be adjusted just prior to placement. Only the water reducer admixtures, if used, may be adjusted during actual placement.

A Certificate of Compliance in conformance with the provisions in Section 6-1.07, "Certificates of Compliance," of the Standard Specifications shall be furnished with each delivery of aggregate, cement, and admixtures used for calibration tests and shall be submitted to the Engineer with a certified copy of the mass of each delivery.

#### **Amendment to California Test 540**

The following amendments to California Test 540, "Method of Making, Handling, and Storing Concrete Compressive Test Specimens in the Field," shall only apply to self-consolidating concrete. The Items "a" and "b" under "2. Test Specimen Fabrication" of "C. Preparation of Test Specimens" of California Test 540 shall be amended to read:



- A. Place test molds on a firm, flat surface to prevent distortion of the bottom surface. When more than one specimen is to be made from the same batch, make all specimens simultaneously. Fill the mold in one lift with a circular motion of the scoop to distribute the concrete evenly in the mold. Pat sides of the mold lightly by hand, or jig by rocking the mold from side to side.
- B. After the sides of the mold have been patted, strike off the surface of the concrete even with the top edge of the mold. Wipe the sides of the mold free of excess concrete and press the lid on to prevent evaporation.

Self-consolidating concrete will be measured and paid for as structural concrete (bridge).

### **MASS CONCRETE**

Mass concrete shall conform to the requirements of Section 90, "Portland Cement Concrete," of the Standard Specifications and these special provisions. Mass concrete construction shall include modeling, providing temperature control and monitoring during placement.

Components listed in the table below shall be considered mass concrete:

Location	Mass Concrete Component
Bent 3	Footing

The Contractor shall control the internal and surface temperature of mass concrete during curing in accordance with the Thermal Control Plan specified herein. Temperature modeling and temperature monitoring is required for the placement of mass concrete. The maximum internal temperature of the mass concrete once placed shall not exceed 65°C and the maximum temperature difference between any surface of the mass concrete and the calculated hottest point will be controlled as described in the Thermal Control Plan.

The concrete temperature shall be monitored by thermocouples or other temperature sensors placed into the concrete, as required in the Thermal Control Plan. Use of ice, liquid nitrogen, insulated curing blankets, insulated forms, cooling pipes and other measures may be necessary to satisfy the temperature requirements.

### **Materials**

Cementitious material for mass concrete shall conform to Section 90-2.01, "Cementitious Materials," of the Standard Specifications.

If fly ash or natural pozzolan is used, the minimum amount of portland cement shall not be less than 48 percent by mass of the specified minimum cementitious material content, and the total amount of fly ash or natural pozzolan shall not exceed 52 percent by mass of the total amount of cementitious material to be used in the mix.

Whenever the cementitious material content of mass concrete is composed of more than 35% supplementary cementitious materials by mass as provided in these special provisions, an additional 62 days will be allowed to obtain the specified compressive strength shown on the plans.

### **Thermal Control Plan**

Prior to commencing any mass concrete placement, the Contractor shall submit a Thermal Control Plan with design calculations in conformance with the provisions in "Working Drawings," of these special provisions to the Engineer for approval for each mass concrete structure component. The Thermal Control Plan shall be based on the design assumption that cracking of the concrete as a result of heat of hydration shall not occur. Analysis shall be performed to determine the maximum allowable temperature differentials between the hottest point of the concrete and the exterior faces. The Thermal Control Plan shall include the following:

- A. Mix design.
- B. Duration and method of curing.
- C. Procedures to control concrete temperature at time of placement.
- D. Methods of controlling temperature differentials.
- E. Temperature sensor types and locations.
- F. Temperature monitoring and recording system.
- G. Dimensions of each typical mass concrete placement, including all locations in the structure to be represented by that placement.
- H. Types and dimensions of materials to be used for mass concrete forms and insulation, and time frames for when the concrete forms and insulation will be removed, including time periods for removal and reinstallation of insulation where required as part of the thermal control plan.

- I. Assumptions for average ambient air and average surface rock temperature for time period of placement and curing of each typical mass concrete element.
- J. If multiple lifts with time delay are proposed, provide lift height and define time delay between lifts.
- K. Include a placing diagram showing the typical mass concrete placement sequence and construction joint locations, if any.
- L. Identify areas where steep cooling gradients may occur, and how cracking will be avoided.
- M. Predict peak temperature, peak differential temperatures and at what approximate times they will occur.
- N. Define allowable time periods for placing or removing insulation and or forms.
- O. A summary of the modeling assumptions used in the analysis.
- P. Field measurements to ensure conformance with the maximum concrete temperature and temperature differential requirements.
- Q. Identify contingency operations to be implemented to control the internal temperature of the concrete should the maximum allowable or the maximum allowable differential temperature be exceeded. For post cooling systems after the peak internal temperature is reached, include the maximum cooling rate at which cracking will not occur.

Temperature modeling for each typical placement shall be included with each thermal control plan submittal. As a minimum, the modeling for each typical placement shall consist of performing a two-dimensional finite-difference analysis (see ACI 207.1R-96). The analysis shall be based on the Contractor's actual mix designs. The coefficient of thermal expansion of the concrete used in the modeling shall be determined by testing of the proposed mixes in accordance with US Army Corps of Engineer's Method CRD-C39-81, "Test Method of Coefficient of Linear Thermal Expansion of Concrete." The heat of hydration used in the modeling for the cementitious blend used in the proposed mix designs shall be tested at 1, 3, 7, and 28 days in accordance with the requirements in ASTM Designation: C 186, "Heat of Hydration of Hydraulic Cement."

### **Construction**

Prior to mass concrete placement, an engineer for the Contractor who is registered as a Civil Engineer in the State of California shall inspect and test the temperature monitoring and recording system. The Contractor's registered engineer shall be present at the jobsite when the mass concrete operation is in progress and shall report to the Engineer in writing on a daily basis the progress of the operation. A copy of the daily report shall be available at the jobsite.

If the Contractor elects to use a mechanical cooling system, the mechanical cooling system shall be designed in conformance with the Thermal Control Plan and the following requirements:

- A. The mechanical cooling system shall be embedded within mass concrete elements and surface connections to cooling pipes shall be removable to a depth of 100 mm from the surface.
- B. Aluminum, copper, or any other dissimilar metal that can cause a corrosion cell with the steel reinforcing shall not be used as cooling pipes.
- C. Forms shall be designed so that removal of the forms shall not disrupt the cooling or temperature monitoring.
- D. Cooling pipes shall not break or deform during mass concrete placement and shall be secured to prevent movement. Damaged cooling pipes shall be removed and replaced immediately.
- E. The mechanical cooling system shall be pressure tested in the presence of the Engineer at 120 percent of the maximum service pressure. The test pressure shall be held for 15 minutes. All leaks shall be repaired and the cooling pipe system shall be retested by the Contractor until the system is free of leaks.
- F. After cooling is completed the cooling water shall be discharged and the cooling pipes shall be thoroughly flushed with potable water. Cooling water and wash water shall be discharged in conformance with "Non-Storm Water Discharges," of these special provisions.
- G. After the mechanical cooling system is no longer needed the cooling pipes shall be fully grouted under pressure with a nonshrink grout mixture in conformance with ASTM Designation: C 1107 and ASTM Designation: C 827 for 0.0 percent shrinkage, and 0.0 percent minimum and 4.0 percent maximum expansion. The placement of nonshrink grout shall be in conformance with the manufacturer's recommendations.
- H. After surface connections to the cooling pipes are removed, the holes shall be reamed and filled with mortar conforming to Section 51-1.135, "Mortar," of the Standard Specifications.

The Contractor may use seawater as cooling water provided that the final temperature of the seawater before discharging back into the bay does not exceed the permit requirements. Holding tanks may be used to cool the water to the required temperature before discharging back into the bay.

The Contractor shall house the pump intake in a manner that prevents injury to fish or other aquatic species and prevent fish entrapment.

Temperature sensors shall be located such that the maximum temperature difference within a mass concrete element can be monitored. As a minimum, the concrete temperature shall be monitored at the calculated hottest point of the concrete, on at least two vertical faces, two corners, and at the center of the top and bottom faces of each pour. For all mass concrete placements, air temperature shall be measured and recorded. If a post-cooling system is used, inlet and outlet water temperatures shall be measured and recorded. The outlet sensors shall be placed within 75 mm of the concrete surface.

Temperature readings shall be automatically recorded on an hourly basis. A redundant set of sensors shall be installed near the primary set. Provision shall be made for recording the redundant set, but records of the redundant sensors need not be made if the primary set is operational. Temperature monitoring may be discontinued when the maximum internal temperature is falling, the maximum allowable temperature difference is greater than the difference between the interior concrete temperature and the average daily temperature for three consecutive days, and there are no mass concrete elements to be cast adjacent.

Methods of concrete consolidation shall prevent damage to the temperature monitoring and recording system. Wiring from thermocouples that must be cast into the concrete shall be protected to prevent movement. Wire runs shall be as short as possible. The ends of the temperature sensors shall not come into contact with either a support or concrete form, or bar reinforcing steel. Temperature monitoring equipment shall be capable of printing and storing data and shall be able to download monitoring data to a computer. Data shall be downloaded and submitted daily to the Engineer.

After the mass concrete pour has been topped out and finished, it shall be revibrated and refinished. Revibration shall extend below the top mat of reinforcement and shall be done as late as the concrete will again respond to vibration. For concrete pours without top reinforcement, revibration shall extend to a depth of 150 mm.

During monitoring, should the specified maximum internal temperature of the mass concrete be exceeded or the maximum allowable temperature difference between any surface of the mass concrete and the hottest point be exceeded, the Contractor shall take immediate measures to correct the situation as specified in the Thermal Control Plan. At the completion of monitoring, the actual readings for the mass concrete element shall be compared with those predicted by the modeling and a summary report shall be prepared by the Contractor's engineer. The report shall include all supplementary or contingency measures implemented and suggested corrections to any future modeling or monitoring to be performed. The summary report shall contain all the temperature data collected for each instrument, both in hard copy and in digital form on diskette. Digital data shall be in Microsoft Excel format or as otherwise approved by the Engineer. The summary report shall also have the data shown in a graphical format with all instruments for a given mass concrete element shown on the same page with time as the horizontal axis. The summary report shall be submitted within one week of completing the monitoring of the mass concrete element.

### **Acceptance**

Mass concrete shall conform to the concrete acceptance criteria and the following temperature requirements:

- A. The maximum allowable temperature of mass concrete shall not exceed 65°C.
- B. The maximum temperature differential of mass concrete shall not exceed the requirement as determined in the Thermal Control Plan.

If the Contractor fails to conform to any of the temperature requirements above, the mass concrete elements will be rejected. The rejected mass concrete shall be removed at the Contractor's expense. The Contractor shall modify the Thermal Control Plan and design calculations to correct the problem and resubmit the revised Thermal Control Plan.

The Contractor shall allow the Engineer 2 weeks for review and approval of the revised Thermal Control Plan. Mass concrete placement shall not begin until the Engineer has approved the revised Thermal Control Plan. No extension of time or compensation will be made for any rejected mass concrete element or revisions of the Thermal Control Plan.

The Contractor shall remove all equipment and materials from the mass concrete element and clean the surface for the Engineer to measure the crack intensity. Surface crack intensity will be determined after monitoring shows the maximum internal temperature has dropped to within 5°C of the outer concrete temperature. Cracking shall be considered excessive if a surface crack intensity on any face of a concrete surface where cracks greater than

0.15 mm in width measure more than 1.0 m in cumulative length within any 2 m square area or where individual cracks greater than 0.15 mm in width measure more than 300 mm in length.

In case of excessive cracking, the Contractor shall suspend further work on members of similar size and configuration, submit a written explanation of the thermal cracking and additional steps to be taken in future to eliminate excessive cracking, and submit proposed modifications in writing to the Engineer for review. Concrete placement shall not be resumed until the Engineer approves the proposed modifications.

Cracks greater than 0.15 mm in width shall be repaired. Cracks greater than 0.15 mm in width and longer than 300 mm shall be filled with pressure-injected epoxy. Cracks to be filled shall be cleaned and filled by pressure injection methods so that all portions of the crack are completely filled with epoxy. Horizontal surfaces may be repaired with high molecular weight methacrylate as approved by the Engineer. No repairs shall begin until the Engineer has approved the repair plan.

Core drilling may be necessary, as determined by the Engineer and at the Contractor's expense, to sample and examine the extent of the cracking and crack filling. The minimum depth of core sampling for mass concrete shall be 0.6 m and the number of cores taken per mass concrete element shall be in accordance with ASTM Designation: C 823. Prior to coring, the Contractor shall identify the location of the main reinforcing steel. The holes shall be cored by methods that will not shatter or damage the concrete adjacent to the holes. Water for core drilling operations shall be fresh water. The coring water shall be disposed in conformance with the requirements in "Construction Site Management," of these special provisions. Immediately after coring, the concrete cores shall be identified by the Contractor with a description of the core locations and submitted to the Engineer for inspection.

If any reinforcement is cut during coring, coring operations shall be terminated, and the Contractor shall submit to the Engineer for approval, the procedure proposed to repair the cut reinforcement and to prevent further cutting of reinforcement. All cored holes shall be filled with nonshrink grout. Cracks not showing full penetration with epoxy shall be reinjected.

At the Contractor's option, for the footings listed in the table above, the above mass concrete requirements may be waived provided the following mass concrete requirements are met:

The temperature of mixed concrete, immediately before placing, shall be not more than 27°C. Use of ice or chilled water may be necessary to satisfy the above temperature requirements.

Concrete shall contain a maximum of 400 kg of cementitious material per cubic meter. A minimum of 192 kg and a maximum of 260 kg of the cementitious material shall be portland cement or a combination of portland cement and Ground Granulated Blast Furnace Slag (GGBFS). Up to 60 percent of GGBFS may be used in the portland cement and GGBFS portion of the mix. The amount of fly ash shall be a minimum of 35 percent to a maximum of 52 percent of the cementitious material. If more than 350 kg of cementitious material per cubic meter of concrete is used, the minimum fly ash content shall be 40 percent of the cementitious material.

Methods of concrete consolidation shall prevent damage to any temperature monitoring and recording system that may be installed by the Engineer.

After the mass concrete pour has been topped out and finished, it shall be revibrated and refinished. Revibration shall extend below the top mat of reinforcement and shall be done as late as the concrete will again respond to vibration. For concrete pours without top reinforcement, revibration shall extend to a depth of 150 mm.

The mass concrete shall be water cured for a minimum of 3 days after placement. Exposed concrete surface shall be insulated with a minimum R-2 to a maximum R-3 insulation one day after placement and shall remain in place for a minimum of one day but no more than 2 days. Insulation of concrete surface may be waived if the ambient air temperature exceeds 30°C at any time during the first 72 hours after placement.

After curing, the Contractor shall remove all equipment and materials from the mass concrete element and clean the surface for the Engineer's inspection.

Full compensation for conforming to the above requirements shall be considered as included in the contract price paid for the contract item of work involved and no additional compensation will be allowed therefor.

## **FALSEWORK**

Falsework shall conform to the provisions in Section 51, "Concrete Structures," of the Standard Specifications and these special provisions.

In addition to the provisions in Section 51-1.06A, "Falsework Design and Drawings," of the Standard Specifications, the time to be provided for the Engineer's review of the working drawings for specific structures, or portions thereof, shall be as follows:

Structure or Portion of Structure	Total Review Time - Weeks
EB On-Ramp Structure (Final)	6
EB Transition Structure (Mod)	6

The Contractor's engineer who signs the falsework drawings shall also certify in writing that the falsework is constructed in conformance with the approved drawings and the contract specifications prior to placing concrete. This certification shall include performing any testing necessary to verify the ability of the falsework members to sustain the stresses required by the falsework design. The engineer who signs the drawings may designate a representative to perform this certification. Where falsework contains openings for railroads, vehicular traffic, or pedestrians, the designated representative shall be qualified to perform this work, shall have at least three years of combined experience in falsework design or supervising falsework construction, and shall be registered as a Civil Engineer in the State of California. For other falsework, the designated representative shall be qualified to perform this work and shall have at least three years of combined experience in falsework design or supervising falsework construction. The Contractor shall certify the experience of the designated representative in writing and provide supporting documentation demonstrating the required experience if requested by the Engineer.

### **Welding and Nondestructive Testing**

Welding of steel members, except for previously welded splices and except for when fillet welds are used where load demands are less than or equal to 175 N/mm for each 3 mm of fillet weld, shall conform to AWS D1.1 or other recognized welding standard. The welding standard to be utilized shall be specified by the Contractor on the working drawings. Previously welded splices for falsework members are defined as splices made prior to the member being shipped to the project site.

Splices made by field welding of steel beams at the project site shall undergo nondestructive testing (NDT). At the option of the Contractor, either ultrasonic testing (UT) or radiographic testing (RT) shall be used as the method of NDT for each field weld and any repair made to a previously welded splice in a steel beam. Testing shall be performed at locations selected by the Contractor. The length of a splice weld where NDT is to be performed, shall be a cumulative weld length equal to 25 percent of the original splice weld length. The cover pass shall be ground smooth at the locations to be tested. The acceptance criteria shall conform to the requirements of AWS D1.1, Section 6, for cyclically loaded nontubular connections subject to tensile stress. If repairs are required in a portion of the weld, additional NDT shall be performed on the repaired sections. The NDT method chosen shall be used for an entire splice evaluation including any required repairs.

For all field welded splices, the Contractor shall furnish to the Engineer a letter of certification which certifies that all welding and NDT, including visual inspection, are in conformance with the specifications and the welding standard shown on the approved working drawings. This letter of certification shall be signed by an engineer who is registered as a Civil Engineer in the State of California and shall be provided prior to placing any concrete for which the falsework is being erected to support.

For previously welded splices, the Contractor shall determine and perform all necessary testing and inspection required to certify the ability of the falsework members to sustain the stresses required by the falsework design. This welding certification shall (1) itemize the testing and inspection methods used, (2) include the tracking and identifying documents for previously welded members, (3) be signed by an engineer who is registered as a Civil Engineer in the State of California, (4) and shall be provided prior to erecting the members.

### **COST REDUCTION INCENTIVE PROPOSAL FOR CAST-IN-PLACE PRESTRESSED BOX GIRDER BRIDGES**

Except as provided herein, cast-in-place prestressed box girder bridges shall be constructed in conformance with the details shown on the plans and the provisions in Section 50, "Prestressing Concrete," and Section 51, "Concrete Structures," of the Standard Specifications.

If the Contractor submits cost reduction incentive proposals for cast-in-place prestressed box girder bridges, the proposals shall be in conformance with the provisions in Section 5-1.14, "Cost Reduction Incentive," of the Standard Specifications and these special provisions.

The Engineer may reject any proposal which, in the Engineer's judgment, may not produce a structure which is at least equivalent to the planned structure.

At the time the cost reduction incentive proposal (CRIP) is submitted to the Engineer, the Contractor shall also submit 4 sets of the proposed revisions to the contract plans, design calculations, and calculations from an independent checker for all changes involved in the proposal, including revisions in camber, predicted deck profile at each construction stage, and falsework requirements to: California Department of Transportation, Office of the Resident Engineer, Contract 04-0120T4, 345 Burma Road, Oakland, CA 94607. When notified in writing by the Engineer, the Contractor shall submit 12 sets of the CRIP plan revisions and calculations to the Engineer for final

approval and use during construction. The calculations shall verify that all requirements are satisfied. The CRIP plans and calculations shall be signed by an engineer who is registered as a Civil Engineer in the State of California.

The CRIP plans shall be either 279 mm x 432 mm, or 559 mm x 864 mm in size. Each CRIP plan sheet and calculation sheet shall include the State assigned designations for the contract number, bridge number, full name of the structure as shown on the contract plans, and District-County-Route-Kilometer Post. Each CRIP plan sheet shall be numbered in the lower right hand corner and shall contain a blank space in the upper right hand corner for future contract sheet numbers.

Within 3 weeks after final approval of the CRIP plan sheets, one set of the corrected good quality prints on 75-g/m<sup>2</sup> (minimum) bond paper, 559 mm x 864 mm in size, of all CRIP plan sheets prepared by the Contractor for each CRIP shall be furnished to the Office of Structure Design, Documents Unit.

Each CRIP shall be submitted prior to completion of 25 percent of the contract working days and sufficiently in advance of the start of the work that is proposed to be revised by the CRIP to allow time for review by the Engineer and correction by the Contractor of the CRIP plans and calculations without delaying the work. The Contractor shall allow a minimum of 12 weeks for the review of a CRIP. In the event that several CRIPs are submitted simultaneously, or an additional CRIP is submitted for review before the review of a previously submitted CRIP has been completed, the Contractor shall designate the sequence in which the CRIPs are to be reviewed. In this event, the time to be provided for the review of any proposal in the sequence shall be not less than the review time specified herein for that proposal, plus 2 weeks for each CRIP of higher priority which is still under review.

Should the review not be complete by the date specified in the Contractor's CRIP, or such other date as the Engineer and Contractor may subsequently have agreed to in writing and if, in the opinion of the Engineer, the Contractor's controlling operation is delayed or interfered with by reason of the delay in review of CRIP plans and calculations, an extension of time commensurate with the delay in completion of the work thus caused will be granted as provided in Section 8-1.07, "Liquidated Damages," of the Standard Specifications except that the provisions in Section 8-1.09, "Right of Way Delays," of the Standard Specifications shall not apply.

Permits and approvals required of the State have been obtained for the structures shown on the plans. Proposals which result in a deviation in configuration may require new permits or approvals. The Contractor shall be responsible for obtaining the new permits and approvals before the Engineer will reach a decision on the proposal. Delays in obtaining permits and approvals will not be reason for granting an extension of contract time.

All proposed modifications shall be designed in conformance with the bridge design specifications and procedures currently employed by the Department. The proposal shall include all related, dependent or incidental changes to the structure and other work affected by the proposal. The proposal will be considered only when all aspects of the design changes are included for the entire structure. Changes, such as but not limited to, additional reinforcement and changes in location of reinforcement, necessary to implement the CRIP after approval by the Engineer, shall be made at the Contractor's expense.

Modifications may be proposed in (1) the thickness of girder stems and deck slabs, (2) the number of girders, (3) the amount and location of reinforcing steel, and (4) the amount and location of prestressing force in the superstructure. The strength of the concrete used may be increased but the strength employed for design or analysis shall not exceed 48 MPa.

Modifications proposed to the minimum amount of prestressing force which must be provided by full length draped tendons are subject to the provisions in "Prestressing Concrete" of these special provisions.

No modifications will be permitted in (1) the foundation type, (2) the span lengths or (3) the exterior dimensions of columns or bridge superstructure. Fixed connections at the tops and bottoms of columns shown on the plans shall not be eliminated.

The Contractor shall be responsible for determining construction camber and obtaining the final profile grade as shown on the plans.

The Contractor shall reimburse the State for the actual cost of investigating CRIPs for cast-in-place prestressed box girder bridges submitted by the Contractor. The Department will deduct this cost from any moneys due, or that may become due the Contractor under the contract, regardless of whether or not the proposal is approved or rejected.

#### **ELASTOMERIC BEARING PADS**

Elastomeric bearing pads shall conform to the provisions in Section 51-1.12H, "Elastomeric Bearing Pads," of the Standard Specifications.

Full compensation for steel plates on top of bearing pads as shown on the plans shall be considered as included in the contract price paid per cubic meter for structural concrete, bridge and no separate payment will be made therefore.

## **MEASUREMENT AND PAYMENT**

Measurement and payment for concrete in structures shall conform to the provisions in Section 51-1.22, "Measurement," and Section 51-1.23, "Payment," of the Standard Specifications and these special provisions.

Full compensation for roughening existing concrete surfaces to a full amplitude of approximately 6 mm shall be considered as included in the contract price paid per cubic meter for structural concrete, bridge and no separate payment will be made therefor.

Full compensation for furnishing and installing access opening covers in soffits of new cast-in-place box girder bridges shall be considered as included in the contract price paid per cubic meter for structural concrete, bridge and no separate payment will be made therefor.

Full compensation for furnishing and installing plastic pipe located at vertical drains used behind retaining walls and bridge abutments, including horizontal or sloping drains down slopes and across sidewalk areas, including excavation and backfill involved in placing the plastic pipe, shall be considered as included in the contract price paid per cubic meter for the various items of concrete work involved and no separate payment will be made therefor.

Full compensation for forming blockouts for modular joints shall be considered as included in the contract price paid per cubic meter for structural concrete, bridge and no separate payment will be made therefor.

Full compensation for public notification and airborne monitoring for deck crack treatment shall be considered as included in the contract price paid per cubic meter for structural concrete, bridge, and no additional compensation will be allowed therefor.

Full compensation for producing Class 1 surface finish on the undersurfaces of box girder spans shall be considered as included in the contract price paid per cubic meter for structural concrete (bridge) and no additional compensation will be allowed therefor.

Full compensation for conforming to the provisions in "Deck Surface Texture" of these special provisions shall be considered as included in the contract price paid per cubic meter for structural concrete (bridge) and no additional compensation will be allowed therefor.

Full compensation for filling blockouts for modular joints with grout as shown on the plans shall be considered as included in the contract price paid per cubic meter for structural concrete, bridge, and no additional compensation will be allowed therefor.

Full compensation for cleaning existing concrete and reinforcement prior to placing new concrete shall be considered as included in the contract price paid per cubic meter for structural concrete (bridge) and no additional compensation will be allowed therefor.

### **10-1.94 PRECAST CONCRETE SLAB (BIKE PATH)**

Precast concrete slab (bike path) shall conform to the provisions in Section 51, "Concrete Structures," of the Standard Specifications and these special provisions.

The Contractor shall submit to the Engineer working drawings for precast concrete slab in accordance with the requirements in Section "Working Drawings" of these special provisions. The number of sets of drawings and times for review shall be the same as specified for falsework working drawings in Section 51-1.06A, "Falsework Design and Drawings," of the Standard Specifications. The working drawings shall include, but not be limited to, the following:

- A. Erection plans showing the placement sequence and location of each individual slab.
- B. Detailed dimensions of each slab.
- C. Reinforcement placement details.
- D. Lifting insert locations and details.

Grout shall conform to the requirements in Section 51-1.13, "Bonding," of the Standard Specifications.

Except where otherwise shown on the plans, the top surface of the slab shall be given a coarse texture by brooming with a stiff bristled broom or by other suitable devices which will result in uniform transverse scoring, in advance of curing operations. The requirements of the seventh paragraph of Section 51-1.17, "Finishing Bridge Decks," of the Standard Specifications shall not apply.

After the concrete slabs are in final position, the closure pour shall be placed.

Longitudinal joints shall be filled with grout as shown on the plans.

No equipment or other loads will be allowed on spans until at least 72 hours after the closure pour has been placed or the last grout has been placed in the longitudinal joints.

Attention is directed to "Miscellaneous Metal (Bridge)" of these special provisions for provisions regarding steel gratings adjoining the bike path where shown on the plans.

After completion of the bike path construction, the Contractor shall remove portion of the existing counterweights located on the Eastbound Transition Structure as shown on the plans. The removal shall be in

accordance with a plan prepared by the Contractor and approved by the Engineer. Removed sections of counterweights shall become the property of the Contractor and shall be disposed of in conformance with the provisions in Section 7-1.13, "Disposal of Material Outside the Highway Right of Way," of the Standard Specifications.

The Contractor shall remove the existing chain link fence located on the north side of the bike path on the Eastbound Transition Structure in a sequence approved by the Engineer.

## **PAYMENT**

Full compensation for furnishing and placing closure pours, grouting longitudinal joints, neoprene pad, placing leveling grout pads, removing counterweights from the Eastbound Transition Structure and removing temporary chain link fence shall be considered as included in the contract unit price paid for erect precast concrete slab (bike path) and no additional compensation will be allowed therefor.

### **10-1.95 PTFE SPHERICAL BEARING**

PTFE spherical bearings, consisting of polytetrafluoro-ethylene (PTFE) and stainless steel bearing surfaces, structural steel plates and anchors, shall conform to the details shown on the plans, the provisions in Section 51, "Concrete Structures," of the Standard Specifications, and these special provisions.

PTFE spherical bearings shall be of the expansion type with spherical and sliding bearing surfaces.

The manufacturer of the PTFE spherical bearings shall show evidence that PTFE spherical bearings furnished by the same manufacturer and used in conditions similar to this application have had at least 3 years of satisfactory service at each of 2 projects.

A qualified representative of the manufacturer shall be present during installation of the first bearing and shall be available for advice during any remaining installations.

The Contractor shall submit working drawings of the PTFE spherical bearings to the Engineer for approval in conformance with the provisions in "Working Drawings" of these special provisions.

The working drawings for PTFE spherical bearings shall include a description of the method of mechanical interlocking of the PTFE fabric to the metallic substrate.

Working drawings shall be submitted sufficiently in advance of the start of the affected work to allow time for review by the Engineer and correction by the Contractor of the drawings without delaying the work. The time shall be proportional to the complexity of the work but in no case shall the time be less than 6 weeks after complete drawings and all support data are submitted.

The edge of the corrected original tracing image shall be clearly visible and visually parallel with the edges of the page. A clear, legible symbol shall be provided as near to the upper left side of each page as is feasible within the original print to show the amount of reduction and a horizontal and vertical scale shall be provided on each reduced print to facilitate enlargement to original scale.

PTFE spherical bearings shall be installed on surfaces prepared in conformance with the provisions in Section 55-3.19, "Bearings and Anchorages," of the Standard Specifications.

The manufacturer shall furnish Certificates of Compliance in conformance with the provisions in Section 6-1.07, "Certificates of Compliance," of the Standard Specifications for all material used in the PTFE spherical bearings. The certification shall be supported by a copy of the results of all proof tests performed on the bearings.

PTFE surfaces of PTFE spherical bearings shall be unfilled PTFE fabric made from virgin PTFE oriented multifilament and other fibers. The resin in the filaments shall be virgin PTFE material (not reprocessed) in conformance with the requirements of ASTM Designation: D 4441.

At the highest point of substrate and after compression, the PTFE fabric shall have a minimum thickness of 1.6 mm and a maximum thickness of 3.2 mm.

Flat stainless steel surfaces shall be a weld overlay on structural steel plate, or solid or sheet stainless steel conforming to the requirements of ASTM Designation: A 240, Type 316 with a minimum thickness of 3.2 mm.

Curved stainless steel surfaces shall be solid stainless steel conforming to the requirements of ASTM Designation: A 240, Type 316.

Curved stainless steel surfaces with dimensions shown on the plans exceeding 101.6 mm in thickness shall be either a weld overlay on structural steel plate or solid stainless steel conforming to the requirements of ASTM Designation: A 240, Type 316. Stainless steel sheet will not be allowed.

When a weld overlay is used for stainless steel surfacing, the overlay shall be placed by submerged arc welding using Type 309L electrodes. The finished overlay shall have a 2.38 mm minimum thickness after welding, grinding, and polishing.



When stainless steel sheets are used for stainless steel surfacing, the sheets shall be attached by perimeter arc welding using Type 309L electrodes. After completion of the weld operation, the stainless steel surface shall be smooth and free from waves.

Steel plates, except stainless steel, shall conform to the requirements of ASTM Designation: A 709/A 709M, Grade 36 [250], 50 [345], or 50W [345W].

Stud connectors shall conform to the provisions in Section 55-2, "Materials," of the Standard Specifications.

Welding of structural steel shall conform to the requirements of AWS D1.1. Welding of structural steel to stainless steel shall conform to the requirements of AWS D1.6.

Convex plate radius dimension tolerances shall be 0.000 to -250  $\mu\text{m}$ . Concave plate radius dimensions shall be +250 to 0.000  $\mu\text{m}$ .

The bearing manufacturer shall have full size convex and concave metal templates for the 2 spherical surfaces of each bearing radius. The templates shall be available to the inspector during all bearing inspections.

The PTFE fabric on spherical or sliding bearing surfaces shall be epoxy bonded and mechanically interlocked to the steel substrate. All bonding shall be done under controlled factory conditions. The mechanical interlock on the spherical concave surface must be integrally machined into the steel substrate. Welded retention grids will not be allowed on the concave surface. Any edges other than the selvage shall be oversown or recessed so that no cut fabric edges are exposed.

After completion of the bonding operation the PTFE surface shall be smooth and free from bubbles.

The surface of the bearing elements shall be controlled such that upon completion of the bearing assembly the PTFE to stainless steel interface shall be in full bearing.

The mating surface of the flat stainless steel with the PTFE surfacing shall have a minimum #8 mirror finish as determined in conformance with the requirements in ANSI Standard B46.1. The mating surface of the curved stainless steel with the PTFE surfacing shall have a finish of less than 0.4  $\mu\text{m}$  root-mean-square (rms), as determined in conformance with the requirements in ANSI Standard B46.1.

Metal surfaces of bearings exposed to the atmosphere and in contact with the structure of the completed work, except stainless steel surfaces, shall be cleaned and painted in conformance with the provisions in "Clean and Paint Joint Seal Assemblies, PTFE Bearings and Restrainer Units (Bar Type)" of these special provisions.

PTFE spherical bearing assemblies shall be assembled at the factory. Each assembly shall have a minimum of 4 temporary steel straps that are bolted to threaded holes in the masonry and sole plates so that the entire assembly is shipped as a unit and remains intact when uncrated and installed. Welding of the steel straps will not be allowed. Straps must be adequate for vertical lifting purposes. Bearing dismantling will only be allowed under the direction and in the presence of the Engineer.

During fabrication, the maximum temperature of bonded PTFE surfaces shall be 150°C.

Damaged bearings and bearings with scratched mating surfaces shall be returned to the factory for replacement or resurfacing.

PTFE spherical bearing sole plates shall be temporarily supported during concrete placement. Temporary supports shall prevent the rotation or displacement of the bearing during concrete placing operations. Temporary supports shall not inhibit the functioning of the PTFE spherical bearing after concrete is placed. Temporary supports shall not restrict the movement at bridge joints due to temperature changes and shortening from prestress forces. Materials for temporary supports within the limits for placing concrete shall conform to the requirements for form fasteners.

PTFE spherical bearings shall have a first movement static coefficient of friction not exceeding 0.06.

Prior to proof testing, all bearings shall be permanently die-stamped on 2 of 4 sides with markings consisting of bearing number and contract number. Each bearing shall have a unique bearing number and match marks on plate edges to insure correct assembly at the job site.

Full sized PTFE spherical bearings shall be proof tested and evaluated for compression and coefficient of friction in the presence of the Engineer. The proof tests shall be performed on samples randomly selected by the Engineer from the production bearings to be used in the work. Proof testing shall be performed by the Contractor at the manufacturer's plant or at an approved laboratory. If proof tests cannot be performed at the specified load, the Contractor shall submit to the Engineer for review and approval a testing plan listing additional physical tests. These tests shall be performed in the presence of the Engineer and shall demonstrate that the requirements for proof testing at the specified load are satisfied. The Contractor shall give the Engineer at least 7 days notice before beginning proof testing. Proof testing of PTFE spherical bearings shall conform to the following requirements:

- A. One bearing per lot of production bearings shall be proof tested. A lot is defined as 25 bearings or fraction thereof of the same type, within a load category. Bearings in 2 load categories with vertical load capacities within 800 kN of each other will be considered in one load category for testing.
- B. Expansion type bearings shall be proof tested for compression and coefficient of friction.

- C. A load category shall consist of bearings of differing vertical load capacity within a range defined as follows:
1. Bearings with less than or equal to 2225 kN maximum vertical load capacity.
  2. Bearings with greater than 2225 kN but less than or equal to 8900 kN maximum vertical load capacity.
  3. Bearings with more than 8900 kN maximum vertical load capacity.
- D. Proof tests for compression: The bearing shall be held at the design rotation or 0.02 radians, whichever is greater, for one hour at 1.5 times the maximum vertical load shown on the plans for the bearing. The device shall be in a rotated position during the test. The rotation may be imposed on the bearing by inserting a beveled plate between the bearing and the restraining surface prior to loading.
- E. Proof tests for coefficient of friction: The tests shall be performed at the minimum vertical load shown on the plans for the bearing with the test load applied for 12 hours prior to friction measurement and the following:
1. The tests shall be arranged to allow measurement of the static coefficient of friction on the first movement of the bearing.
  2. The first movement static and dynamic coefficients of friction shall be measured at a sliding speed not exceeding 25 millimeters per minute and shall not exceed the specified coefficient of initial static friction.
  3. The test bearings shall be subjected to a minimum of 100 movements of at least 25 mm of relative movement at a sliding speed not exceeding 300 millimeters per minute. After cycling, the first movement static and dynamic coefficients of friction shall be measured again at a sliding speed not exceeding 25 millimeters per minute and shall not exceed the specified coefficient of initial static friction.
- F. The bearing surfaces shall be cleaned prior to proof testing.
- G. Proof testing of bearings shall be done after conditioning specimens for 12 hours at  $21^{\circ}\pm 8^{\circ}\text{C}$ .
- H. The proof tested bearings shall show no visible sign of: (1) bond failure of bearing surfaces, (2) separation or lift-off of plates from each other or from PTFE surfaces, or (3) other defects. When a proof tested bearing fails to comply with these specifications, all bearings in that lot shall be individually tested for acceptance.
- I. Proof test results shall be certified correct and signed by the testing laboratory personnel who conducted the test and interpreted the test results. Proof test results shall include the bearing numbers of the bearings tested.

Quantities of PTFE spherical bearings will be determined as units from actual count in the completed work. A PTFE spherical bearing with more than one PTFE surface shall be considered a single PTFE spherical bearing.

The contract unit price paid for PTFE spherical bearing shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in constructing the bearing, complete in place, including masonry and sole plates, anchor bolts and sleeves, mortaring of bolts, temporary supports, proof testing, and cleaning and painting of PTFE spherical bearings, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

If a portion or all of PTFE spherical bearings are either fabricated or tested at a site more than 480 air line kilometers from both Sacramento and Los Angeles, additional shop inspection expenses will be sustained by the State. Whereas it is and will be impractical and extremely difficult to ascertain and determine the actual increase in such expenses, it is agreed that payment to the Contractor for PTFE spherical bearings will be reduced \$5,000 for each fabrication or testing site located more than 480 air line kilometers from both Sacramento and Los Angeles and an additional \$10,000 (\$15,000 total) for each fabrication or testing site located more than 4800 air line kilometers from both Sacramento and Los Angeles.

#### **10-1.96 BIKE PATH EXPANSION JOINT**

Bike path expansion joints, consisting of structural steel plates with bonded polytetrafluoro-ethylene (PTFE) strips, structural steel shapes, stainless steel plates, stainless steel bolts, and headed steel anchors shall conform to the details shown on the plans and these special provisions.

The metal components of the bike path expansion joints shall conform to the provisions in Section 75-1.03, "Miscellaneous Bridge Metal," of the Standard Specifications and "Miscellaneous Metal (Bridge)" of these special provisions.

The manufacturer shall furnish certificates of compliance in conformance with the provisions in Section 6-1.07, "Certificates of Compliance," of the Standard Specifications for all material used in the bike path expansion joint.

PTFE surfaces and bonding of PTFE surfaces to underside of steel plates shall conform to the requirements for "PTFE Spherical Bearing" of these special provisions.

### **NONSKID SURFACE**

Where shown on the plans, steel plates shall receive a nonskid surface consisting of epoxy mixed with grit. Epoxy shall conform to the provisions in Section 95, "Epoxy," of the Standard Specifications.

Epoxy shall consist of epoxy conforming to the provisions in either Section 95-2.01, "Binder (Adhesive), Epoxy Resin Base (State Specification 8040-01F-03)," or Section 95-2.09, "Epoxy Sealant for Inductive Loops (State Specification 8040-31D-06)," of the Standard Specifications.

Grit shall consist of commercial quality aluminum oxide, silicon carbide, or almandite garnet grit particles, screen size 1.7 mm to 600  $\mu$ m or 1.4 mm to 500  $\mu$ m, applied uniformly at the rate of at least 1.5-kg per square meter of surface area.

The finish color of the nonskid surface shall be charcoal gray. Color shall be approved by the Engineer prior to use.

Prior to applying epoxy and grit to galvanized surfaces, the surface to be coated shall be prepared in conformance with the provisions in Section 59-3.02, "Surface Preparation," of the Standard Specifications.

At least 2 weeks prior to placing any nonskid surface, the Contractor shall submit to the Engineer for approval the method of application stating the spread rate of epoxy and grit and the number of coats and a 0.1 square meter test panel placed on 6 mm minimum thickness galvanized steel.

At the option of the Contractor, a test panel of a commercial quality nonskid surface, comprised of a 2-component ultra violet resistant epoxy and grit of quality equal to the above requirements, may be submitted to the Engineer for approval.

### **MEASUREMENT AND PAYMENT**

Bike path expansion joint will be measured and paid for by the meter of expansion joint in the completed work actually installed.

The contract price paid per meter of bike path expansion joint shall include full compensation for furnishing all labor, materials, tools, equipment and incidentals and all work involved in fabricating, furnishing and installing the work involved in constructing the bike path expansion joint including nonskid surface, as shown on the plans, as specified in the Standard Specification and these special provisions, and as directed by the Engineer.

If a portion or all of the bike path expansion joints are either fabricated or tested at a site more than 480 air line kilometers from both Sacramento and Los Angeles, additional shop inspection expenses will be sustained by the State. Whereas it is and will be impractical and extremely difficult to ascertain and determine the actual increase in such expenses, it is agreed that payment to the Contractor for bike path expansion joints will be reduced \$5,000 for each fabrication or testing site located more than 480 air line kilometers from both Sacramento and Los Angeles and an additional \$10,000 (\$15,000 total) for each fabrication or testing site located more than 4800 air line kilometers from both Sacramento and Los Angeles.

## **10-1.97 STRUCTURE APPROACH SLABS (TYPE EQ (3) MOD)**

### **GENERAL**

#### **Summary**

This work includes constructing reinforced concrete approach slabs, structure approach drainage systems, and treated permeable base.

Reinforced concrete approach slabs must comply with Section 51, "Concrete Structures," of the Standard Specifications.

#### **Submittals**

Furnish a Certificate of Compliance under Section 6-1.07, "Certificates of Compliance," of the Standard Specifications for the geocomposite drain certifying that the drain complies with these special provisions. The Certificate of Compliance must be accompanied by a flow capability graph for the geocomposite drain showing flow rates and the externally applied pressures and hydraulic gradients. The flow capability graph must be stamped with the verification of an independent testing laboratory.

Notify the Engineer of the type of treated permeable base to be furnished at least 30 days before the start of placement. Once you have notified the Engineer of the selection, the type to be furnished must not be changed without a prior written request to do so and approval thereof by the Engineer.

## **MATERIALS**

### **Concrete**

Concrete for structure approach slabs must contain not less than 400 kilograms of cementitious material per cubic meter and must either:

1. Cure for not less than 5 days before opening to public traffic, or
2. Comply with "Rapid Strength Concrete for Structures" of these special provisions.

### **Drainage Pads**

Concrete for use in drainage pads must be minor concrete, except the concrete must contain not less than 300 kilograms of cementitious material per cubic meter.

### **Geocomposite Drain**

Geocomposite drain must consist of a manufactured core not less than 6.35 mm thick nor more than 50 mm thick with one or both sides covered with a layer of filter fabric that will provide a drainage void. The drain must produce a flow rate through the drainage void of at least 25 liters per minute per meter of width at a hydraulic gradient of 1.0 and a minimum externally applied pressure of 168 kPa.

The manufactured core must be one of the following:

1. Preformed grid of embossed plastic
2. Mat of random shapes of plastic fibers
3. Drainage net consisting of a uniform pattern of polymeric strands forming 2 sets of continuous flow channels
4. System of plastic pillars and interconnections forming a semirigid mat

The core material and filter fabric must be capable of maintaining the drainage void for the entire height of geocomposite drain. Filter fabric must be integrally bonded to the side of the core material with the drainage void.

### **Filter Fabric**

Filter fabric must comply with the specifications for filter fabric for underdrains in Section 88, "Engineering Fabrics," of the Standard Specifications.

### **Treated Permeable Base**

Treated permeable base under structure approach slabs must be an asphalt treated permeable base or a cement treated permeable base as specified in Section 29, "Treated Permeable Bases," of the Standard Specifications.

Steel angles, plates, and bars at the concrete barrier joints must comply with Section 75-1.03, "Miscellaneous Bridge Metal," of the Standard Specifications.

Hardboard and expanded polystyrene must comply with Section 51-1.12D, "Sheet Packing, Preformed Pads, and Board Fillers," of the Standard Specifications.

## **CONSTRUCTION**

### **Geocomposite Drain**

Install the geocomposite drain with the drainage void and the filter fabric facing the embankment. The fabric facing the embankment side must overlap a minimum of 75 mm at all joints and wrap around the exterior edges a minimum of 75 mm beyond the exterior edge. If additional fabric is needed to provide overlap at joints and wraparound at edges, the added fabric must overlap at least 150 mm and be attached to the fabric on the geocomposite drain.

Place core material manufactured from impermeable plastic sheeting having non-connecting corrugations with the corrugations approximately perpendicular to the drainage collection system.

If the fabric on the geocomposite drain is torn or punctured, replace the damaged section completely or repair it by placing a piece of fabric that is large enough to cover the damaged area and provide a 150 mm overlap.

If asphalt treated permeable base is placed around the slotted plastic pipe at the bottom of the geocomposite drain, it must be placed at a temperature of not less than 82°C nor more than 110°C.

### **Filter Fabric**

Place filter fabric immediately after grading and compacting the subgrade to receive the filter fabric.

Align, handle, and place filter fabric in a wrinkle-free manner under the manufacturer's recommendations.

Adjacent borders of the filter fabric must be overlapped from 300 mm to 450 mm or stitched. The preceding roll must overlap the following roll in the direction the material is being spread or must be stitched. When the fabric is joined by stitching, it must be stitched with yarn of a contrasting color. The size and composition of the yarn must be as recommended by the fabric manufacturer. The number of stitches per 25 mm of seam must be 5 to 7.

Equipment or vehicles must not be operated or driven directly on the filter fabric.

### **Treated Permeable Base**

Construct treated permeable base under Section 29, "Treated Permeable Bases," of the Standard Specifications and these special provisions.

Place asphalt treated permeable base at a temperature of not less than 93°C nor more than 121°C. Do not use material stored in excess of 2 hours in the work.

Asphalt treated permeable base may be spread in 1 layer. Compact with a vibrating shoe type compactor or a roller weighing at least 1.3 tonnes but no more than 4.5 tonnes. Begin compacting base as soon as the mixture has cooled sufficiently to support the weight of the equipment without undue displacement.

Cement treated permeable base may be spread in 1 layer. Compact base with a vibrating shoe type compactor or with a steel-drum roller weighing at least 1.3 tonnes but no more than 4.5 tonnes. Compaction must begin within one-half hour of spreading and must consist of 2 complete coverages of the cement treated permeable base.

### **Finishing Approach Slabs**

Finish and treat the top surface of approach slabs under Section 51-1.17, "Finishing Bridge Decks," of the Standard Specifications. Edges of slabs must be edger finished.

Cure approach slabs with pigmented curing compound (1) under the specifications for curing structures in Section 90-7.01B, "Curing Compound Method," of the Standard Specifications.

### **Sealing Joints**

Type AL joint seals must comply with Section 51-1.12F, "Sealed Joints," of the Standard Specifications. The sealant may be mixed by hand-held power-driven agitators and placed by hand methods.

The sealant may be mixed by hand-held power-driven agitators and placed by hand methods. Immediately before placing the seal, thoroughly clean the joint, including abrasive blast cleaning of the concrete surfaces, so that all foreign material and concrete spillage are removed from all joint surfaces. Joint surfaces must be dry at the time the seal is placed.

## **MEASUREMENT AND PAYMENT**

Structural concrete, approach slab (Type EQ (3)-Mod) will be measured and paid for in conformance with the provisions in Section 51-1.22, "Measurement," and Section 51-1.23, "Payment," of the Standard Specifications and these special provisions.

Full compensation for miscellaneous bridge metal, pourable seals, and epoxy-coated bar reinforcement, and neoprene strip shall be considered as included in the contract price paid per cubic meter for structural concrete, approach slab (Type EQ (3) Mod), and no additional compensation will be allowed therefor.

### **10-1.98 DRILL AND BOND DOWELS**

Drilling and bonding dowels shall conform to the details shown on the plans, the provisions in Section 83-2.02D(1), "General," of the Standard Specifications, and these special provisions.

Dowels shall conform to the provisions for bar reinforcement in "Reinforcement" of these special provisions.

If reinforcement is encountered during drilling before the specified depth is attained, the Engineer shall be notified. Unless the Engineer approves coring through the reinforcement, the hole will be rejected and a new hole, in which reinforcement is not encountered, shall be drilled adjacent to the rejected hole to the depth shown on the plans.

Unless otherwise provided, dowels to be bonded into drilled holes will be paid for as bar reinforcing steel (bridge).

Unless otherwise provided, drilling and bonding dowels will be measured and paid for by the meter determined by the number and the required depth of holes as shown on the plans or as ordered by the Engineer.

The contract price paid per meter for drill and bond dowel shall include full compensation for furnishing all labor, materials (except reinforcing steel dowels), tools, equipment, and incidentals, and for doing all the work

involved in drilling the holes, including coring through reinforcement when approved by the Engineer, and bonding the dowels, complete in place, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

#### **10-1.99 CORE CONCRETE**

Coring concrete shall consist of coring holes through reinforced concrete bridge members as shown on the plans and in conformance with these special provisions.

The holes shall be cored by methods that will not shatter or damage the concrete adjacent to the holes.

Water for core drilling operations shall be from the local domestic water supply or shall not contain more than 1000 parts per million of chlorides as Cl, nor more than 1300 parts per million of sulfates as SO<sub>4</sub>, nor shall the water contain any impurities in a sufficient amount to cause discoloration of the concrete or produce etching of the surface.

Water from core drilling operations shall not be permitted to fall on public traffic, to flow across shoulders or lanes occupied by public traffic, or to flow into gutters or other drainage facilities.

Coring concrete will be measured by the meter as core concrete of the sizes listed in the Engineer's Estimate. The cored concrete will be measured along the centerline of the hole without deduction for expansion joints.

The contract price paid per meter for core concrete of the sizes listed in the Engineer's Estimate shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in coring the holes, including control of water from core drilling, as shown on the plans, as specified in these special provisions, and as directed by the Engineer.

#### **10-1.100 ROADWAY LIGHT POLE FOUNDATION (BRIDGE)**

This work shall consist of constructing roadway light pole foundations (bridge) for roadway light poles and fixtures in conformance with the details and locations as shown on the plans, and as specified in these special provisions.

Concrete and reinforcement for roadway light pole foundations (bridge) shall conform to "Concrete Structures," and "Reinforcement," of these special provisions.

Anchor bolts not designated on the plans as high strength (HS) or stainless steel shall conform to the requirements in ASTM Designation: F 1554, Grade 36. High strength anchor bolts shall conform to the requirements in ASTM Designation: F 1554, Grade 105.

Anchor bolts shall be placed in proper position and to proper height and alignment, and shall be held in place by means of a template. The Contractor shall use the anchor bolt template provided by the Engineer..

One double heavy hex nut, one leveling nut, and 2 washers shall be provided for the upper threaded portion of each anchor bolt.

All ferrous metal parts shall be galvanized and shall not be painted.

Full compensation for constructing roadway light pole foundations (bridge) including furnishing and installing anchor bolts, leveling nuts, double heavy hex nuts, and washers shall be considered as included in the contract price paid per cubic meter for structural concrete (bridge) or structural concrete (retaining wall) and no separate payment will be made therefor.

#### **10-1.101 SEALING JOINTS**

Joints in concrete bridge decks and joints between concrete structures and concrete approach slabs must be sealed in conformance with the details shown on the plans, the provisions in Section 51, "Concrete Structures," of the Standard Specifications, and these special provisions.

When ordered by the Engineer, a joint seal larger than called for by the Movement Rating shown on the plans must be furnished and installed. Payment to the Contractor for furnishing the larger seal and for saw cutting the increment of additional depth of groove required will be determined as provided in Section 4-1.03, "Changes," of the Standard Specifications.

#### **10-1.102 JOINT SEAL ASSEMBLIES (MAXIMUM MOVEMENT RATING, 100 mm)**

Joint seal assemblies shall conform to the details shown on the plans, the provisions in Section 51, "Concrete Structures," of the Standard Specifications, and these special provisions.

All metal parts of the joint seal assembly shall conform to the provisions in Section 75-1.03, "Miscellaneous Bridge Metal," of the Standard Specifications. Bolts, nuts, and washers shall conform to the provisions for components of high-strength steel fastener assemblies in Section 75-1.02, "Miscellaneous Iron and Steel," of the Standard Specifications.

All new metal surfaces of the joint seal assembly, except stainless steel and anchorages embedded in concrete, shall be cleaned and painted in conformance with the provisions in "Clean and Paint Joint Seal Assemblies, and PTFE Bearings and Restrainer Units (Bar Type)" of these special provisions.

Sheet neoprene shall conform to the provisions for neoprene in Section 51-1.14, "Waterstops," of the Standard Specifications. The sheet neoprene shall be fabricated to fit the joint seal assembly accurately.

Metal parts of the joint seal assembly shall be pre-assembled before installation to verify the geometry of the completed seal.

The bridge deck surface shall conform to the provisions in Section 51-1.17, "Finishing Bridge Decks," of the Standard Specifications prior to placing and anchoring the joint seal assembly.

The assembly shall be placed in a blocked out recess in the concrete deck surface. The depth and width of the recess shall permit the installation of the assembly anchorage components or anchorage bearing surface to the lines and grades shown on the plans.

Sheet neoprene shall be installed at such time and in such manner that the sheet neoprene will not be damaged by construction operations. The joint shall be cleaned of all dirt, debris and other foreign material immediately prior to installation of the sheet neoprene.

#### **ALTERNATIVE JOINT SEAL ASSEMBLY**

At the Contractor's option, an alternative joint seal assembly may be furnished and installed provided: (1) that the quality of the alternative and its suitability for the intended application are at least equal to that of the joint seal assembly shown on the plans, (2) that acceptable working drawings and a Certificate of Compliance are furnished as specified herein and (3) that the alternative conforms to the following requirements:

- A. The determination as to the quality and suitability of a joint seal assembly will be made in the same manner as provided in Section 6-1.05, "Trade Names and Alternatives," of the Standard Specifications. The factors to be considered will include: the ability of the assembly to resist the intrusion of foreign material and water throughout the full range of movement for the application, and the ability to function without distress to any component.
- B. Joint seal assemblies will not be considered for approval unless it can be proven that the assembly has had at least one year of satisfactory service under conditions similar to this application.
- C. The Contractor shall submit complete working drawings for each joint seal assembly to the Engineer for approval in conformance with "Working Drawings" of these special provisions. The working drawings shall show complete details of the joint seal assembly and anchorage components and the method of installation to be followed, including concrete blockout details and additions or rearrangements of the reinforcing steel from that shown on the plans.
- D. The working drawings shall be supplemented with calculations for each proposed joint seal assembly, as requested by the Engineer. The design firm's name, address, and telephone number shall be shown on the working drawings. Each sheet shall be numbered in the lower right hand corner and shall contain a blank space in the upper right hand corner for future contract sheet numbers.
- E. Calculations, when requested, and working drawings, shall be stamped and signed by an engineer who is registered as a Civil Engineer. The Contractor shall allow the Engineer 4 weeks to review the drawings after a complete set has been received.
- F. Each shipment of joint seal materials shall be accompanied by a Certificate of Compliance in conformance with the provisions in Section 6-1.07, "Certificates of Compliance," of the Standard Specifications. The certificate shall state that the materials and fabrication involved comply in all respects to the specifications and data submitted in obtaining the approval.
- G. The elastomer portion of the joint seal assembly shall be neoprene conforming to the requirements in Table 1 of ASTM Designation: D 2628 and the following, except that no recovery tests or compression-deflection tests will be required:

PROPERTY	Test Method	Requirement
Hardness, Type A Durometer, points	ASTM D 2240 (Modified)	55-70
Compression set, 70 hours at 100°C, maximum, percent	ASTM D 395 (Modified)	40

- H. All metal parts of an alternative joint seal assembly shall conform to the requirements above for the joint seal assembly shown on the plans. At the Contractor's option, metal parts may conform to the requirements in ASTM Designation: A 572/A 572M.

- I. The assembly and its components shall be designed to support the AASHTO HS20-44 loading with 100 percent impact. The tire contact area used to distribute the tire loads shall be 244 mm, measured normal to the longitudinal axis of the assembly, by 508 mm wide. The assembly shall provide a smooth riding joint without slapping of components or wheel tire rumble.
- J. The Movement Rating of the assembly shall be measured normal to the longitudinal axis of the assembly. The dimensions for positioning the assembly within the Movement Rating during installation shall be measured normal to the longitudinal axis, disregarding any skew of the deck expansion joint.
- K. The assembly shall have cast-in-place anchorage components forming a mechanical connection between the joint components and the concrete deck.
- L. The maximum depth and width of the recess shall be such that the primary reinforcement to provide the necessary strength of the structural members is outside the recess. The maximum depth of the recess at abutments and at hinges shall be 250 mm. The maximum width of the recess on each side of the expansion joint shall be 300 mm.
- M. All reinforcement other than the primary reinforcement shall continue through the recess construction joint into the recess and engage the anchorage components of the assembly.
- N. Horizontal angle points and vertical corners at curbs in assemblies shall consist of either pre-molded sections or standard sections of the joint seal assembly that have been specially miter cut or bent to fit the structure.
- O. The elastomer portion of the assembly shall be installed in conformance with the manufacturer's recommendations at such time and in such a manner that the elastomer portion will not be damaged by construction operations. The joint and blockout shall be cleaned of all dirt, debris, and other foreign material immediately prior to the installation of the elastomer.
- P. All new metal surfaces of the alternative joint seal assembly, except stainless steel and anchorages embedded in concrete, shall be cleaned and painted in conformance with the provisions in "Clean and Paint Joint Seal Assemblies, PTFE Bearings and Restrainer Units (Bar Type)" of these special provisions.

Full compensation for additional materials or work required because of the use of an alternative type joint seal assembly shall be considered as included in the contract price paid per meter for the joint seal assembly involved and no additional compensation will be allowed therefor.

Full compensation for cleaning and painting shall be considered as included in the contract price paid per meter for the joint seal assembly involved and no additional compensation will be allowed therefor.

#### **10-1.103 INSTALL MODULAR JOINT SEAL ASSEMBLY**

This work shall consist of inspection, shipping and installation of State-furnished modular joint seal assemblies in conformance with the details shown on the plans and the requirements of these special provisions.

The Contractor's attention is directed to section "State-Furnished Materials" of these special provisions.

The modular joint seal assemblies shall consist of supporting elements, supports, sealing elements, and anchorage elements.

#### **MANUFACTURER**

Modular joint seal assemblies shall be a Maurer Sohne Swivel-Joist Expansion Joint manufactured and supplied by:

THE D.S. BROWN COMPANY  
300 E. CHERRY STREET  
NORTH BALTIMORE, OHIO 45872  
TEL: (419) 257-3561  
FAX: (419) 257-2200

#### **WORKING DRAWINGS**

The Contractor shall submit working drawings in conformance with the provisions in section "Working Drawings" elsewhere in these special provisions, and these special provisions.

Working drawings shall include the method, materials, equipment, and procedures of installation that the Contractor proposes to use.

Working drawing submittal shall include the following:

- A. Installation plans including methods, materials, equipment, sequence, lifting mechanisms and locations, details of temporary anchorage during setting, temperature adjustment devices, opening dimensions relative



- to temperature, installation details at curbs, seal installation details and other procedures that the Contractor proposes to use for installation of the modular joint seal assemblies.
- B. Plan for achieving water tightness including details related to performing the water tightness test as specified in these special provisions.
  - C. Anchorage components including concrete blockout details and any additions or rearrangements of the reinforcing steel from that shown on the plans.
  - D. Storage plans for interim storage and on-site storage details including temporary support for the modular joint seal assemblies.
  - E. Plans for transporting and handling the modular joint seal assemblies.

A supplement to the working drawings shall include the modular joint seal assembly inspection report as specified in these special provisions.

The working drawings and supplement shall be stamped and signed by an engineer who is registered as a Civil Engineer in the State of California.

After complete working drawings and supplement are received by the Engineer, the Contractor shall allow the Engineer 20 working days to review the submittal. No shipping or installation of the modular joint seal assemblies shall begin until the Engineer has reviewed and approved the working drawings and supplement submittal.

Upon completion of installation, the Contractor shall submit to the Engineer certification stating that each modular joint seal assembly was installed in accordance with the approved working drawings installation procedure.

### **STORAGE, TRANSPORTATION, AND HANDLING**

The modular joint seal assemblies are stored at a storage facility within 25 km of the San Francisco-Oakland Bay Bridge Toll Plaza. The Contractor shall notify the Engineer at least two weeks prior to pick-up of the modular joint seal assemblies from storage.

Prior to transporting the modular joint seal assemblies to the bridge site, the Contractor shall inspect the modular joint seal assemblies for damage at the storage location. The Contractor shall furnish to the Engineer a modular joint seal assembly inspection report. The inspection report shall include the condition of the modular joint seal assembly and any existing damages that may have occurred prior to the Contractor's receiving the assembly. If no damage is found, the Contractor shall include a statement in the inspection report to state that the modular joint seal assembly is in good condition and acceptable for delivery and installation.

Lifting mechanisms, temperature adjustment devices, and temporary anchorages shall not be welded to the center beams.

Damage to the modular joint seal assembly during transportation or handling shall be cause for rejection of the modular joint seal assembly.

Damage to the corrosion protection system shall be repaired to the satisfaction of the Engineer prior to installation.

### **INSTALLATION**

No modular joint seal assembly shall be installed until the Engineer has reviewed and approved, in writing, the working drawings and supplement.

A qualified manufacturer's installation technician shall be present at the job site to assure proper installation of each modular joint seal assembly. The qualified installation technician shall inspect the blockout prior to installation and shall be present during lowering of the modular joint seal assembly into the blockout, leveling, adjusting of the cell width and grouting below support boxes. The qualified installation technician shall inspect anchorage reinforcement and the formwork before placing concrete and shall be present during the concrete placement operation. The Contractor shall comply with all recommendations made by the modular joint seal assembly manufacturer's installation technician as approved by the Engineer. Each modular joint seal installation technician shall certify to the Engineer that the approved installation procedures were followed. All certifications to the Engineer shall be in writing and shall be signed and dated by the manufacturer's installation technician.

The modular joint seal assembly shall be installed in accordance with the approved working drawings and supplement and the recommendations of the manufacturer's installation technician.

The installed modular joint seal assembly shall match the finished roadway profile and grades.

The Contractor shall protect the modular joint seal assembly from damage. The Contractor shall protect concrete blockouts and support systems from damage and construction traffic prior to installation of the modular joint seal assembly.

The modular joint seal assembly shall be set to a gap width corresponding to the ambient temperature at the time of setting. The gap widths shall conform to the values shown on the plans and approved working drawings and supplement. The Contractor shall provide hardware for mechanically opening or closing the modular joint seal

assembly for thermal adjustments. The manufacturer shall provide factory attached lifting devices and brackets to facilitate field handling and grade adjustments.

The modular joint seal assembly shall be tested for water tightness after installation. The Contractor shall flood the completely installed modular joint seal assembly with water to a minimum depth of 75 millimeters for a duration of at least one hour. If leakage is observed, the modular joint seal assembly shall be repaired to the satisfaction of the Engineer at the Contractor's expense. The repair procedure shall be prepared by the modular joint seal assembly manufacturer and shall be submitted to the Engineer for approval. After repairs are completed, the modular joint seal assembly shall be retested for leakage.

The Contractor shall replace sealing elements not fully bonded to the steel extrusions with fully bonded seals at the expense of the Contractor.

The assembly shall have cast-in-place anchorage components forming a mechanical connection between the joint components and the concrete deck.

The bridge deck surface shall conform to the provisions in Section 51-1.17, "Finishing Bridge Deck," of the Standard Specifications after placing modular joint seal assembly and anchorage.

The assembly shall be completely assembled and placed in a blocked out recess as shown on the plans.

All reinforcement other than primary reinforcement shall continue through the recess construction joint into the recess and engage the anchorage components of the assembly.

The vertical modular joint seal assembly in barrier shall be available for inspection after placement of the recess concrete around the anchorage components of the assembly.

The assembly shall make a watertight, continuous return 150 mm up into the barrier at the low side of the deck joint. Neoprene glands shall be continuous without field splices or joints, including the return up into barrier.

## **MEASUREMENT AND PAYMENT**

Install modular joint seal assembly of the types listed in the Engineer's Estimate will be paid by contract lump sum price.

The contract lump sum price paid for install modular joint seal assembly of the types listed in the Engineer's Estimate shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in installing modular joint seal assembly, complete in place, including inspection prior to transporting, storing, transporting, water testing and inspection and certification by a qualified installation technician of the modular joint seal assembly manufacturer, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

## **10-1.104 POLYESTER CONCRETE OVERLAY**

### **GENERAL**

#### **Summary**

This work includes placing a polyester concrete overlay with a high molecular weight methacrylate (HMWM) resin prime coat to bridge decks and bike path, and EB-80 pavement at grade as shown on the plans.

#### **Submittals**

Submit an overlay placement plan and a public safety plan in conformance with the provisions in "Working Drawings" of these special provisions. The plan review time will be 15 days.

The overlay placement plan must include:

1. Schedule of overlay work and testing for each bridge
2. Description of equipment for applying HMWM resin
3. Description of equipment for measuring, mixing, placing, and finishing polyester concrete overlay
4. Method for isolating expansion joints
5. Cure time for polyester concrete
6. Description of equipment for applying sand
7. Storage and handling of HMWM resin and polyester concrete components
8. Disposal of excess HMWM resin, polyester concrete, and containers

The public safety plan must include details for:

1. A public notification letter with a list of delivery and posting addresses. The letter must state overlay work locations, dates, times, and what to expect. Deliver the letter to residences and businesses within 30 meters of overlay work and to local fire and police officials at least 7 days before starting work. Post the letter at the job site.

2. An airborne emissions monitoring plan prepared and executed by a certified industrial hygienist (CIH) certified in comprehensive practice by the American Board of Industrial Hygiene. The plan must have at least 4 monitoring points including the mixing point, application point, and point of nearest public contact. Monitor airborne emissions during overlay work and submit emissions monitoring results after completing the work.
3. An action plan for protection of the public when airborne emissions levels exceed permissible levels.
4. A copy of the CIH's certification.

Submit a material safety data sheet for each shipment of HMWM and polyester resin components before use.

### **Quality Control and Assurance**

Submit samples of HMWM and polyester resins 15 days before use under Section 6-3, "Testing," of the Standard Specifications. Notify the Engineer 15 days before delivery of resin in containers over 209 liters to the job site.

Polyester concrete for the bike path shall be colored as shown on the plans. Referee samples of Federal Color No. 26099, "Charcoal Gray" and Federal Color No. 26440, "Light Gray" are available for inspection as specified in "Supplemental Project Information," of these special provisions.

Complete a trial overlay before starting work. Results from airborne emissions monitoring of the trial overlay must be submitted to the Engineer before starting production work.

The trial overlay must:

1. Be at least 3.6 meters wide by 1.8 meters long and the same thickness as the project overlay for the bike path and 35 mm thickness for the bridge deck.
2. Be constructed on a prepared concrete base
3. Be placed at an approved location within 10 kilometers of the project site.
4. Be constructed using the same equipment as the production work
5. Replicate field conditions for the production work
6. Determine the initial polyester concrete set time
7. Demonstrate suitability of the proposed means and methods
8. Demonstrate suitability of the airborne emissions monitoring plan
9. Be disposed of under Section 7-1.13, "Disposal of Material Outside the Highway Right of Way," of the Standard Specifications

A trial overlay is required for each color of the polyester concrete overlay on the bike path.

The trial overlay approved by the Engineer shall be used as the standard of determining acceptability of color and appearance for the polyester concrete surfaces.

### **MATERIALS**

Polyester concrete consists of polyester resin binder and aggregate.

Polyester resin binder must:

1. Be an unsaturated isophthalic polyester-styrene co-polymer.
2. Contain at least 1 percent by weight gamma-methacryloxypropyltrimethoxysilane, an organosilane ester silane coupler.
3. Be used with a promoter compatible with suitable methyl ethyl ketone peroxide and cumene hydroperoxide initiators.
4. Comply with the following:

### Polyester Resin Binder

Property	Requirement	Test Method
Viscosity *	0.075 to 0.200 Pa·s (RVT, No. 1 Spindle, 20 RPM at 25°C)	ASTM D 2196
Specific Gravity *	1.05 to 1.10 at 25°C	ASTM D 1475
Elongation	35 percent, minimum Type I at 11.5 mm/min. Thickness = 6.5±1 mm	ASTM D 638
	Sample Conditioning: 18/25/50 + 5/70	ASTM D 618
Tensile Strength	17.5 MPa, minimum Type I at 11.5 mm/min. Thickness = 6.5±1 mm	ASTM D 638
	Sample Conditioning: 18/25/50 + 5/70	ASTM D 618
Styrene Content *	40 percent to 50 percent by weight	ASTM D 2369
PCC Saturated Surface-Dry Bond Strength	3.5 MPa, minimum, at 24 hours and 21° ± 1°C	California Test 551
Static Volatile Emission *	60 gram per square meter, loss, maximum	SCAQMD Method 309-91

\*Test must be performed before adding initiator.

Aggregate for polyester concrete must:

1. Comply with Section 90-2.02, "Aggregates," of the Standard Specifications
2. Have at most 45 percent crushed particles retained on the 2.36-mm sieve when tested under California Test 205
3. Have fine aggregate consisting of natural sand
4. Have a weighted average aggregate absorption of at most 1 percent when tested under California Tests 206 and 207
5. At the time of mixing with resin, have a moisture content of at most one half of the weighted average aggregate absorption when tested under California Test 226
6. Comply with one of the following aggregate gradings:

### Combined Aggregate Grading

Sieve Size	Percentage Passing	
	3/8 inch Maximum	No. 4 Maximum
12.5-mm	100	100
9.5-mm	83 - 100	100
4.75-mm	65 - 82	62 - 85
2.36-mm	45 - 64	45 - 67
1.18-mm	27 - 48	29 - 50
600-µm	12 - 30	16 - 36
300-µm	6 - 17	5 - 20
150-µm	0 - 7	0 - 7
75-µm	0 - 3	0 - 3

HMWM resin prime coat consists of a resin, promoter, and initiator. HMWM resin must:

1. Be low odor and wax-free
2. Comply with the following:

### **Methacrylate Resin**

Property	Requirement	Test Method
Volatile Content *	30 percent, maximum	ASTM D 2369
Viscosity *	0.025 Pa·s, maximum, (Brookfield RVT with UL adaptor, 50 RPM at 25°C)	ASTM D 2196
Specific Gravity *	0.90 minimum, at 25°C	ASTM D 1475
Flash Point *	82°C, minimum	ASTM D 3278
Vapor Pressure *	1.0 mm Hg, maximum, at 25°C	ASTM D 323
PCC Saturated Surface-Dry Bond Strength	3.5 MPa, minimum at 24 hours and 21 ± 1°C	California Test 551

\* Test must be performed before adding initiator.

Sand for abrasive sand finish must:

1. Be commercial quality blast sand
2. Have at least 95 percent pass the 2.36-mm sieve and at least 95 percent retained on the 0.85-mm sieve when tested under California Test 205
3. Have an average absorption of at most 1 percent when tested under California Test 207

### **CONSTRUCTION**

Use a continuous mixer to mix polyester concrete. The continuous mixer must:

1. Employ an auger screw/chute device.
2. Be equipped with an automatic metering device that measures and records aggregate and resin volumes. Record volumes at least every 5 minutes, including time and date. Submit recorded volumes at the end of the work shift.
3. Have a visible readout gage that displays volumes of aggregate and resin being recorded.
4. Be certified under California Test 109 before use.
5. Produce a satisfactory mix consistently during a demonstration.

Polyester concrete may be mixed in mechanical mixers of at most 0.25-cubic meter capacity.

Finishing equipment for polyester concrete must:

1. Have grade control capabilities
2. Be used to consolidate the polyester concrete

The Engineer will provide final grade and cross slope before the start of overlay work.

The Engineer may (1) test existing deck surfaces for smoothness under Section 51-1.17, "Finishing Bridge Decks," of the Standard Specifications, and (2) require the deck smoothness be modified under Section 42-2, "Grinding," of the Standard Specifications.

New polyester concrete surfaces on bridge deck must comply with Deck Surface Texture in "Concrete Structures" of these special provisions.

Prepare the deck under "Prepare Concrete Bridge Deck Surface," and "Remove Concrete Deck Surface" of these special provisions.

The deck must be dry before placing the HMWM prime coat. The concrete surface must be at least 10 degrees C and at most 38 degrees C. Relative humidity must be at most 85 percent.

Sweep the deck. Blow the deck clean with compressed air.

Thoroughly mix all components of HMWM resin prime coat. Apply the HMWM resin to the deck surface:

1. Within 5 minutes of mixing
2. At a rate of approximately 2.2 square meters per liter. Use 1.35 square meters per liter where deck surface is removed.
3. Uniformly and spread to completely cover surfaces to be overlaid

Place the HMWM prime coat on magnesium phosphate concrete no sooner than 72 hours after final set or on modified high alumina based concrete no sooner than 30 minutes after final set.

Initiate the polyester resin binder and blend completely. Add aggregate and mix for at least 2 minutes.

Place the polyester concrete:

1. Immediately after applying the HMWM prime coat
2. Before gelling
3. Within 15 minutes of adding initiator

The resin binder must weigh approximately 12 percent of the weight of the aggregate. The Engineer will determine the exact percentage. Polyester concrete must have an initial set time of at least 30 minutes and at most 120 minutes when tested using an initial-setting time Gillmore needle under ASTM C 266.

Consolidate and finish the overlay to the required grade and cross section using finishing equipment. Polyester concrete must be consolidated to a relative compaction of at least 97 percent when tested under California Test 552.

Apply a sand finish of at least 0.4-kg per square meter before gelling occurs.

Protect the overlay from moisture for at least 4 hours after finishing. Allow traffic or equipment on the overlay no sooner than 4 hours after final finishing.

Completed polyester concrete deck surfaces must comply with Section 51-1.17, "Finishing Bridge Decks," of the Standard Specifications.

The finished surface of the polyester concrete overlay for the bike path shall be broomed transversely to the line of traffic. At the option of the Contractor, clean dry sand may be spread on the surface and used to aid in the broomed surface texturing.

Taper polyester concrete overlay edges if the overlay is not completed within the allowable lane closure time and is more than 12 mm higher in elevation than the adjacent pavement. Taper edges transverse to the direction of traffic at a 1:20 (vertical:horizontal) slope. Taper edges longitudinal to the direction of traffic at a 1:4 (vertical:horizontal) slope. Tapers may remain and be overlaid with polyester concrete overlay.

## **MEASUREMENT AND PAYMENT**

Furnish polyester concrete overlay will be measured and paid for by the cubic meter. The volume to be paid for will be determined based on the quantity of resin binder used, the percent by weight of resin binder in the polyester concrete, and a unit weight of 2160 kg per cubic meter. The payment quantity shall be the calculated quantity of polyester concrete overlay used in the work, except material used in trial overlays and wasted or unused material. When the plans show that unsound concrete patching material is polyester overlay, the payment quantity will include the patches.

Place polyester concrete overlay will be measured and paid for by the square meter. The area to be paid for will be based on the plan dimensions.

The contract price paid per cubic meter for furnish polyester concrete overlay of the types shown in the Engineer's Estimate shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in furnishing polyester concrete, including furnishing HMWM resin prime coat and materials for trial overlays, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as ordered by the Engineer.

The contract price paid per square meter for place polyester concrete overlay of the types shown in the Engineer's Estimate shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in constructing the polyester concrete overlay, complete in place, including application of HMWM prime coat and constructing and disposing of trial overlays and base, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as ordered by the Engineer.

Full compensation for furnishing and mixing color shall be considered as included in the contract price paid per cubic meter for furnish polyester concrete overlay (12 mm) and no additional compensation will be allowed therefor.

Full compensation for public safety plan including the public action plan and airborne emissions monitoring work performed by the CIH, notification of the public, and reporting test results shall be considered as included in the contract prices paid for the items of polyester concrete overlay involved and no additional compensation will be allowed therefor.

Modifications to existing bridge deck smoothness will be paid for as extra work as provided in Section 4-1.03D, "Extra Work," of the Standard Specifications.

#### 10-1.105 ARCHITECTURAL SURFACE (TEXTURED CONCRETE)

Architectural texture for concrete surfaces shall conform to the details shown on the plans and the provisions in Section 51, "Concrete Structures," of the Standard Specifications and these special provisions.

Architectural treatment required at concrete surfaces shown on the plans shall be fractured rib texture.

The fractured rib texture shall be an architectural texture simulating the appearance of straight ribs of concrete with a fractured concrete texture imparted to the raised surface between the ribs. Grooves between ribs shall be continuous with no apparent curves or discontinuities. Variation of the groove from straightness shall not exceed 6 mm for each 3 m of groove. The architectural texture shall have random shadow patterns. Broken concrete at adjoining ribs and groups of ribs shall have a random pattern. The architectural texture shall not have secondary patterns imparted by shadows or repetitive fractured surfaces.

#### TEST PANEL

A test panel at least 1.25 m x 1.25 m in size shall be successfully completed at a location approved by the Engineer before beginning work on architectural textures. The test panel shall be constructed and finished with the materials, tools, equipment and methods to be used in constructing the architectural texture. If ordered by the Engineer, additional test panels shall be constructed and finished until the specified finish, texture and color are obtained, as determined by the Engineer.

The test panel approved by the Engineer shall be used as the standard of comparison in determining acceptability of architectural texture for concrete-surfaces.

#### FORM LINERS

Form liners shall be used for textured concrete surfaces and shall be installed in conformance with the manufacturer's recommendations, unless other methods of forming textured concrete surfaces are approved by the Engineer. Form liners shall be manufactured from an elastomeric material or a semi-elastomeric polyurethane material by a manufacturer of commercially available concrete form liners. No substitution of other types of formliner material will be allowed. Form liners shall leave crisp, sharp definition of the architectural surface. Recurring textural configurations exhibited by repeating, recognizable shadow patterns shall be prevented by proper casting of form liner patterns. Textured concrete surfaces with such recurring textural configurations shall be reworked to remove such patterns as approved by the Engineer or the concrete shall be replaced.

Form liners shall have the following properties:

Description	ASTM Designation:	Range
Elastomeric material		
Shore A hardness	D 2240	20 to 65
Tensile strength (MPa)	D 412	0.9 to 6.2
Semi-elastomeric polyurethane		
Shore D hardness	D 2240	55 to 65
Tensile strength (MPa)	D 2370	18 minimum

Cuts and tears in form liners shall be sealed and repaired in conformance with the manufacturer's recommendations. Form liners that are delaminated from the form shall not be used. Form liners with deformations to the manufactured surface caused by improper storage practices or any other reason shall not be used.

Form liners shall extend the full length of texturing with transverse joints at 2.5 m minimum spacing. Small pieces of form liners shall not be used. Grooves shall be aligned straight and true. Grooves shall match at joints between form liners. Joints in the direction of grooves in grooved patterns shall be located only in the depressed portion of the textured concrete. Adjoining liners shall be butted together without distortion, open cracks or offsets at the joints. Joints between liners shall be cleaned before each use to remove any mortar in the joint.

Adhesives shall be compatible with the form liner material and with concrete. Adhesives shall be approved by the liner manufacturer. Adhesives shall not cause swelling of the liner material.

### **RELEASING FORM LINERS**

Products and application procedures for form release agents shall be approved by the form liner manufacturer. Release agents shall not cause swelling of the liner material or delamination from the forms. Release agents shall not stain the concrete or react with the liner material. For reliefs simulating fractured concrete or wood grain surfaces the application method shall include the scrubbing method using a natural bristle scrub brush in the direction of grooves or grain. The release agent shall coat the liner with a thin film. Following application of form release agent, the liner surfaces shall be cleaned of excess amounts of agent using compressed air. Buildup of form release agent caused by the reuse of a liner shall be removed at least every 5 uses.

Form liners shall release without leaving particles or pieces of liner material on the concrete and without pulling or breaking concrete from the textured surface. The concrete surfaces exposed by removing forms shall be protected from damage.

### **ABRASIVE BLASTING**

The architectural texture shall be abrasive blasted with fine abrasive to remove the sheen without exposing coarse aggregate.

### **CURING**

Concrete surfaces with architectural texture shall be cured only by the forms-in-place or water methods. Seals and curing compounds shall not be used.

### **MEASUREMENT AND PAYMENT**

Architectural texture will be measured and paid for by the square meter.

The contract price paid per square meter for architectural texture of the types listed in the Engineer's Estimate shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in architectural texture, complete in place, including test panels, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

### **10-1.106 REINFORCEMENT**

Reinforcement shall conform to the provisions in Section 52, "Reinforcement," of the Standard Specifications and these special provisions.

Where ASTM Designations: A706/A706M reinforcing bars are specified on the plans or in the special provisions, the minimum percentage of elongation in 200 mm for Bar Nos. 43 and 57 on Table 2 of ASTM A706/706M Specifications shall be 12%.

The Department's Pre-Qualified Products List for mechanical splices can be found at:

[http://www.dot.ca.gov/hq/esc/approved\\_products\\_list/](http://www.dot.ca.gov/hq/esc/approved_products_list/)

Where mechanical couplers or bar reinforcement is shown on the plans to extend to or beyond concrete surface in order to accommodate future reinforcing bar extensions, such couplers or bar reinforcement shall be greased and wrapped to protect against corrosion.

The provisions in "Welding Quality Control" of these special provisions do not apply to resistance butt welding.

When joining new reinforcing bars to existing reinforcement, sample splices shall be made using only the deformation pattern of the new reinforcement to be spliced.

The following shall apply to ultimate splices for bar reinforcing cages of columns and cast-in-place piles where the longitudinal bars are spliced vertically at the job site in or above their final positions:

1. Instead of being removed from the completed lot, sample splices may be prepared in the same manner as specified in Section 52-1.08C(2)(a), "Production Test Requirements for Service Splices," of the Standard Specifications for service sample splices. These sample splices shall be tested in conformance with the requirements in Section 52-1.08C(3), "Ultimate Butt Splice Test Criteria," of the Standard Specifications.
2. Splices may be encased in concrete prior to having the QCM review, approve, and forward each Production Test Report to the Engineer. Should the Contractor exercise this option, it is expressly understood that the Contractor will not be relieved of the Contractor's responsibility for incorporating material in the work that conforms to the requirements of the plans and specifications. Material not conforming to these requirements will be subject to rejection.



For bar reinforcing cages measuring 1.2 meters in diameter and larger:

1. At least 4 vertical bars of each cage, equally spaced around the circumference, shall be tied at all reinforcement intersections with double wire ties.
2. At least 25 percent of remaining reinforcement intersections in each cage shall be tied with single wire ties. Tied intersections shall be staggered from adjacent ties.
3. Bracing shall be provided to avoid collapse of the cage during assembly, transportation, and installation.

Successful completion of these minimum baseline requirements for reinforcement cages 4 feet in diameter and larger will in no way relieve the Contractor of full responsibility for engineering the temporary support and bracing of the cages during construction.

### **EPOXY-COATED PREFABRICATED REINFORCEMENT**

Bar reinforcement to be epoxy coated shall conform to the ASTM designation and grade required or permitted by Section 52-1.02A, "Bar Reinforcement," of the Standard Specifications for the location or type of structure involved. The coated bar reinforcement shall conform to the requirements in ASTM Designation: A 934/A 934M except as provided herein.

Wire reinforcement to be epoxy coated shall conform to the ASTM designation and grade required or permitted by Section 52-1.02D, "Reinforcing Wire," of the Standard Specifications for the location or type of structure involved. The coated wire reinforcement shall conform to the requirements for Class A, Type 2 coating of ASTM Designation: A 884/A 884M except as provided herein.

Appendices X1 and X2, "Guidelines For Job-Site Practices," of ASTM Designation: A 884/A 884M and A 934/A 934M, respectively, applies except as provided herein. The term "shall" replaces the term "should" in these appendices. Section X1.2 of Appendix X1 and Section X2.2 of Appendix X2 do not apply.

All coatings shall be purple or gray in color.

The epoxy powder coating shall be selected from the Department's Pre-Qualified Products List.

A Certificate of Compliance conforming to the provisions in Section 6-1.07, "Certificates of Compliance," of the Standard Specifications shall be furnished for each shipment of epoxy-coated bar or wire reinforcement certifying that the coated bars or wire conform to the requirements in ASTM Designation: A 934/A 934M for bars or Designation: A 884/A 884M for wire and the provisions in these special provisions. This Certificate of Compliance shall include all the certifications specified in ASTM Designation: A 934/A 934M for bars or ASTM Designation: A 884/A 884M for wire. All qualification testing and certification shall be by an independent laboratory.

Except for field welding of butt splices, all welding of reinforcement shall be complete before epoxy coating the reinforcement.

Before epoxy coating, all resistance butt welds shall have the weld flash removed to produce a smooth profile free of any sharp edges that would prevent proper coating of the bar. The flash shall be removed such that the ultimate tensile strength and elongation properties of the bar are not reduced and the outside radius of the flash at any point along the circumference of the bar is (1) not less than the nominal radius of the bar nor (2) greater than 5 mm beyond the nominal radius of the bar.

A proposed weld flash removal process shall be submitted to and approved by the Engineer in writing before performing any removal work. The submittal shall demonstrate that the proposed flash removal process produces a smooth profile that can be successfully epoxy coated in conformance with the requirements specified herein.

Bending of epoxy-coated reinforcement after the coating has been applied will not be allowed.

When any portion of a reinforcing bar or wire requires epoxy coating, the entire bar or wire shall be coated except when the bar or wire is spliced outside of the limits of epoxy coating shown on the plans, epoxy coating will not be required on the portion of bar or wire beyond the splice.

Within areas where epoxy-coated reinforcement is required, tie wire and bar chairs or other metallic devices used to secure or support the reinforcement shall be plastic coated or epoxy coated to prevent corrosion of the devices or damage to the coated reinforcement.

Prior to coating, the Contractor shall furnish to the Transportation Laboratory a representative 110 g sample from each batch of epoxy coating material to be used. Each sample shall be packaged in an airtight container identified with the manufacturer's name and batch number.

Two 700-mm-long samples of coated bar or wire reinforcement from each size and from each load shipped to the job site shall be furnished to the Engineer for testing. These samples shall be representative of the material furnished. These samples, as well as any additional random samples taken by the Engineer, may be tested for specification compliance. Additional sampling and all tests performed by the Engineer may be performed at any

location deemed appropriate by the Engineer. Failure of any sample to meet the requirements of the specifications will be cause for rejection.

If any bar tested for coating thickness or for adhesion of coating fails to meet the requirements for coated bars in Section 9 of ASTM Designation: A 934/A 934M, 2 retests on random samples taken from bars represented by the failed test will be conducted for each failed test. If the results of both retests meet the specified requirements, the coated bars represented by the samples may be certified as meeting the test requirements.

If any wire reinforcement tested for coating thickness or for flexibility fails to meet the requirements for coated wire in Section 8 of ASTM Designation: A 884/A 884M, 2 retests on random samples taken from wire represented by the failed test will be conducted for each failed test. If the results of both retests meet the specified requirements, the coated wire represented by the samples may be certified as meeting the test requirements.

Epoxy-coated reinforcement shall be covered with an opaque polyethylene sheeting or other suitable protective material to protect the reinforcement from exposure to sunlight, salt spray, and weather. For stacked bundles, the protective covering shall be draped around the perimeter of the stack. The covering shall be adequately secured; however, it should allow for air circulation around the reinforcement to prevent condensation under the covering. Epoxy-coated reinforcement shall not be stored within 300 m of ocean or tidal water for more than 2 months.

All visible damage to coatings caused by shipping, handling, or installation shall be repaired as required for repairing coating damaged before shipment conforming to the requirements in ASTM Designation: A 934/A 934M for bar reinforcement or ASTM Designation: A 884/A 884M for wire reinforcement. When the extent of coating damage prior to repair exceeds 2 percent of the bar or wire surface area in any 300 mm length, repair of the bar or wire will not be allowed and the coated bar or wire will be rejected.

The patching material and process shall be suitable for field application. The patching material shall be prequalified as required for the coating material and shall be either identified on the container as a material compatible with the reinforcement coating or shall be accompanied by a Certificate of Compliance certifying that the material is compatible with the reinforcement coating. Damaged areas shall be patched in conformance with the patching material manufacturer's recommendations.

Except for lap splices, all splices for epoxy-coated reinforcement shall be coated with a corrosion protection covering that is selected from the Department's Pre-Qualified Products List. The covering shall be installed in conformance with the manufacturer's recommendations.

Any portion of bar or wire reinforcement extending beyond the limits for epoxy-coated reinforcement shown on the plans will be measured and paid for as bar reinforcing steel (bridge) or bar reinforcing steel (retaining wall), as appropriate.

## **MEASUREMENT AND PAYMENT**

Measurement and payment for reinforcement in structures shall conform to the provisions in Section 52-1.10, "Measurement," and Section 52-1.11, "Payment," of the Standard Specifications and these special provisions.

Full compensation for removing wrapping and cleaning grease from existing reinforcing couplers where shown on the plans shall be considered as included in the contract price paid per kilogram for bar reinforcing steel (bridge) and no additional compensation will be allowed therefor.

Epoxy coated reinforcement incorporated into hinges will be measured and paid for as bar reinforcing steel (bridge).

### **10-1.107 HEADED BAR REINFORCEMENT**

#### **GENERAL**

Headed bar reinforcement shall consist of bar reinforcement with heads attached to one or both ends and shall conform to the provisions of Section 52, "Reinforcement," of the Standard Specifications, the details shown on the plans, and these special provisions. The type of headed bar reinforcement to be used on this project shall be selected from the Department's Pre-Qualified Products List at:

[http://www.dot.ca.gov/hq/esc/approved\\_products\\_list](http://www.dot.ca.gov/hq/esc/approved_products_list)

The provisions of "Welding Quality Control" of these special provisions shall not apply to headed bar reinforcement.

The Contractor shall perform inspection and testing before, during, and after manufacturing headed bar reinforcement and as necessary to ensure that materials and workmanship conform to the requirements of the specifications.

A daily production log for the manufacture of headed bar reinforcement shall be maintained by the manufacturer for each production lot. The log shall clearly indicate the production lot numbers, the heats of bar material and head material used in the manufacture of each production lot, the number of bars in each production lot,

and manufacturing records, including tracking and production parameters for welds or forgings. The data from the daily production log shall be available to the Engineer on request.

A production lot of headed bar reinforcement is defined as 150 reinforcing bars, or fraction thereof, of the same bar size, with heads of the same size and type, and manufactured by the same method, produced from bar material of a single heat number and head material of a single heat number. If one reinforcing bar has a head on both ends, it will be counted as 2 reinforcing bars for the purposes of establishing and testing production lots. A new production lot shall be started if the heat number of either the bar material or the head material changes before the maximum production lot size of 150 units is reached.

The Contractor shall furnish Certificates of Compliance accompanied by a copy of the mill test report, the Production Tests Reports specified herein, and the corresponding daily production logs to the Engineer in conformance with the provisions in Section 6-1.07, "Certificates of Compliance," of the Standard Specifications for each shipment of headed bar reinforcement delivered to the jobsite.

Welding, welder qualifications, and inspection of welding shall conform to the requirements for friction welding in ANSI/AWS C6.1.

Equipment used to perform friction welding shall be fitted with an effective in-process monitoring system to record essential production parameters that describe the process of welding the head onto the reinforcement. The parameters to be recorded shall include friction welding force, forge force, rotational speed, friction upset distance and time, and forge upset distance and time. The data from this monitoring shall be recorded and preserved by the manufacturer until acceptance of the contract and shall be provided to the Engineer upon request.

## **PRODUCTION TESTS**

Production tests shall be performed at the Contractor's expense, at an independent qualified testing laboratory. The independent qualified testing laboratory used to perform the testing of headed bar reinforcement samples shall not be employed or compensated by any subcontractor, or by other persons or entities hired by subcontractors who will provide other services or materials for the project, and shall have the following:

1. A tensile testing machine capable of breaking the largest size of reinforcing bar to be tested.
2. Operators who have received formal training for performing the testing requirements of ASTM A 970/A 970M.
3. A record of annual calibration of testing equipment performed by an independent third party that has 1) standards that are traceable to the National Institute of Standards and Technology, and 2) a formal reporting procedure, including published test forms.

The Engineer shall be notified in writing when any lots of headed bar reinforcement are ready for testing. The notification shall include the number of lots to be tested and the location where the tests are to be conducted. After notification has been received, test samples will be randomly selected by the Engineer from each production lot of headed bar reinforcement that is ready for shipment to the jobsite. If epoxy coating is required, test samples will be taken after the headed bar reinforcement has been prepared for epoxy coating.

A minimum of 3 samples from each production lot shall be tested. One tensile test shall be conducted on each sample.

Tensile tests shall conform to the requirements specified in ASTM A 970/A 970M, Section 6, Class A, except that at rupture, there shall be visible signs of necking in the reinforcing bar 1) at a minimum distance of one bar diameter away from the head to bar connection for friction welded headed bar reinforcement, or 2) outside the affected zone for integrally forged headed bar reinforcement.

The affected zone for integrally forged headed bar reinforcement is the portion of the reinforcing bar where any properties of the bar, including the physical, metallurgical, or material characteristics, have been altered during the manufacturing process.

If one of the test specimens fails to meet the specified requirements, one retest shall be performed on one additional sample, selected by the Engineer, from the same production lot. If the additional test specimen, or if more than one of the original test specimens fail to meet these requirements, all headed bar reinforcement in the lot represented by the tests will be rejected in conformance with the provisions in Section 6-1.04, "Defective Materials," of the Standard Specifications.

A Production Test Report for all testing performed on each lot shall be prepared by the independent testing laboratory and submitted to the Engineer as specified herein. The report shall be signed by an engineer who represents the laboratory and is registered as a Civil Engineer in the State of California. The report shall include the following information for each set of samples: contract number, bridge number, lot number, bar size, type of headed bar reinforcement, physical condition of test sample, any notable defects, limits of affected zone, location of visible necking area, and the ultimate strength of each headed bar.

Each unit of headed bar reinforcement in a production lot to be shipped to the site shall be tagged in a manner such that production lots can be accurately identified at the jobsite. All unidentified headed bar reinforcement received at the jobsite will be rejected.

## **MEASUREMENT AND PAYMENT**

Quantities of headed bar reinforcement will be measured as units determined from the number of heads shown on the plans or as directed by the Engineer.

The contract unit price paid for headed bar reinforcement shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in furnishing headed bar reinforcement, including conforming to all testing requirements, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

Bar reinforcement to be used in the manufacture of headed bar reinforcement and placing the completed headed bar reinforcement into the work will be measured and paid for as specified in Section 52, "Reinforcement," of the Standard Specifications, except that the lengths to be used in the computation of calculated mass of bar reinforcement shall be the entire length of the completed headed bar, including heads.

### **10-1.108 ERECT STATE-FURNISHED BIKEPATH AT PIER W2**

This work shall consist of inspection, shipping, and erection of State-furnished bikepath in conformance with the details shown on the plans and the requirements of these special provisions.

The bikepath consists of the structural elements, sealing elements, and anchorage elements as shown on the plans.

The Contractor's attention is directed to "State-Furnished Materials" of the special provisions.

Metal components to be furnished shall conform to the provisions in "Miscellaneous Metal (Bridge)" of these special provisions. Bikepath railing shall conform to "Bike Path Railing" of the special provisions.

Expansion joint plate shall conform to "Bikepath Expansion Joint" of these special provisions.

Welding shall conform to "Welding" of the special provisions.

Prestressing of high strength rods shall conform to "Prestressing" of the special provisions.

Polyester concrete overlay shall conform to "Polyester Concrete Overlay" of the special provisions.

## **WORKING DRAWINGS**

The Contractor shall submit working drawings in conformance with the provisions in section "Working Drawings" elsewhere in these special provisions, and these special provisions.

Working drawings shall include the method, materials, equipment, and procedures of erection that the Contractor proposes to use.

Working drawing submittal shall include the following:

1. Erection plans including methods, materials, equipment, sequence, lifting mechanisms and locations, and other procedures that the Contractor proposes to use for erection of the bikepath.
2. Anchorage components
4. Storage plans for interim storage and on-site storage details including temporary support for the bikepath.
5. Plans for transporting and handling the bikepath.

A supplement to the working drawings shall include the bikepath inspection report as specified in these special provisions.

The working drawings and supplement shall be stamped and signed by an engineer who is registered as a Civil Engineer in the State of California.

After complete working drawings and supplement are received by the Engineer, the Contractor shall allow the Engineer 20 working days to review the submittal. No shipping or erection of the bikepath shall begin until the Engineer has reviewed and approved the working drawings and supplement submittal.

Upon completion of erection, the Contractor shall submit to the Engineer certification stating that the bikepath was erected in accordance with the approved working drawings erection procedure.

## **STORAGE, TRANSPORTATION, AND HANDLING**

The bikepath is stored at a storage facility within 25 km of the San Francisco-Oakland Bay Bridge Toll Plaza. The Contractor shall notify the Engineer at least two weeks prior to pick-up of the bikepath from storage.

Prior to transporting the bikepath components to the bridge site, the Contractor shall inspect the bikepath components for damage at the storage location. The Contractor shall furnish to the Engineer a bikepath inspection

report. The inspection report shall include the condition of the bikepath and any existing damages that may have occurred prior to the Contractor's receiving the bikepath. If no damage is found, the Contractor shall include a statement in the inspection report to state that the bikepath is in good condition and acceptable for delivery and erection.

Damage to the bikepath during transportation or handling shall be repaired to original condition as determined by the Engineer.

Damage to the paint system shall be repaired to original condition as determined by the Engineer.

### **ERECTION**

No bikepath shall be erected until the Engineer has reviewed and approved, in writing, the working drawings and supplement.

The bikepath shall be erected in accordance with the approved working drawings and supplement.

The installed bikepath shall match the finished bikepath profile and grades.

Steel shims shall be used as necessary for bikepath railing to provide proper alignment as shown on the plans.

### **MEASUREMENT AND PAYMENT**

Erect State-furnished bikepath will be paid for by lump sum price.

The contract lump sum price paid for erect State-furnished bikepath shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in erecting bikepath, complete in place, including bikepath railing and inspection prior to transporting, storing and transporting bikepath, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

Full compensation for furnishing all materials (except for the bikepath expansion joint plate and State-furnished materials) as shown on the plans shall be considered as included in the contract lump sum price paid for erect State-furnished bikepath and no additional compensation will be allowed therefor.

## **10-1.109 DIRECTIONAL SIGN**

### **GENERAL**

#### **Summary**

This work includes furnishing and installing directional signs as shown on the plans, as specified in Section 56-2, "Roadside Signs," of the Standard Specifications, and these special provisions.

Directional signs shall consist of galvanized steel posts and frames.

The finish coat for directional sign steel posts and frames shall conform to the provisions in "Clean and Paint Structural Steel (Miscellaneous Facilities)," of these special provisions.

The finish coat shall be applied in 2 applications. The first application shall consist of a spray applied mist application. The second application shall be applied after the mist application has dried to a set to touch condition as determined by the procedure described in Section 7 of ASTM Designation: D 1640. The finish coat color shall be equal blend of Federal Standard colors # 27925 and #27880. The total dry film thickness of both applications of the finish coat shall be not less than 125  $\mu\text{m}$ .

### **MEASUREMENT AND PAYMENT**

The quantity of directional sign will be measured as unit determined from actual count.

The contract unit price paid for directional sign shall include full compensation for furnishing all labor, materials, tools, equipment and incidentals and for doing all work involved in furnishing and installing directional sign, complete in place, including galvanized and painted steel posts and frames, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

## **10-1.110 ROADSIDE SIGNS**

Roadside signs shall be furnished and installed at the locations shown on the plans or where designated by the Engineer and in conformance with the provisions in Section 56-2, "Roadside Signs," of the Standard Specifications and these special provisions.

The Contractor shall furnish roadside sign panels in conformance with the provisions in "Furnish Sign" of these special provisions.

Wood posts shall be pressure treated after fabrication in conformance with the provisions in Section 58, "Preservative Treatment of Lumber, Timber and Piling," of the Standard Specifications and AWP A Use Category System: UC4A, Commodity Specification A or B.Type N, Type P, and Type R marker panels mounted on a post with a roadside sign shall be considered to be sign panels and will not be paid for as markers.

### **10-1.111 FURNISH SIGN**

Signs shall be fabricated and furnished in accordance with details shown on the plans, the Traffic Sign Specifications, and these special provisions.

Traffic Sign Specifications for California sign codes are available for review at:

<http://www.dot.ca.gov/hq/traffops/signtech/signdel/specs.htm>

Traffic Sign Specifications for signs referenced with Federal MUTCD sign codes can be found in Standard Highway Signs Book, administered by the Federal Highway Administration, which is available for review at:

[http://mutcd.fhwa.dot.gov/ser-shs\\_millennium.htm](http://mutcd.fhwa.dot.gov/ser-shs_millennium.htm)

Information on cross-referencing California sign codes with the Federal MUTCD sign codes is available at:

<http://www.dot.ca.gov/hq/traffops/signtech/signdel/specs.htm>

Temporary or permanent signs shall be free from blemishes that may affect the serviceability and detract from the general sign color and appearance when viewing during daytime and nighttime from a distance of 8 m. The face of each finished sign shall be uniform, flat, smooth, and free of defects, scratches, wrinkles, gel, hard spots, streaks, extrusion marks, and air bubbles. The front, back, and edges of the sign panels shall be free of router chatter marks, burns, sharp edges, loose rivets, delaminated skins, excessive adhesive over spray and aluminum marks.

### **QUALITY CONTROL FOR SIGNS**

The requirements of "Quality Control for Signs" in this section shall not apply to construction area signs.

No later than 14 days before sign fabrication, the Contractor shall submit a written copy of the quality control plan for signs to the Engineer for review. The Engineer will have 10 days to review the quality control plan. Sign fabrication shall not begin until the Engineer approves the Contractor's quality control plan in writing. The Contractor shall submit to the Engineer at least 3 copies of the approved quality control plan. The quality control plan shall include, but not be limited to the following requirements:

- A. Identification of the party responsible for quality control of signs,
- B. Basis of acceptance for incoming raw materials at the fabrication facility,
- C. Type, method and frequency of quality control testing at the fabrication facility,
- D. List (by manufacturer and product name) of process colors, protective overlay film, retroreflective sheeting and black non-reflective film,
- E. Recommended cleaning procedure for each product, and
- F. Method of packaging, transport and storage for signs.

No legend shall be installed at the project site. Legend shall include letters, numerals, tildes, bars, arrows, route shields, symbols, logos, borders, artwork, and miscellaneous characters. The style, font, size, and spacing of the legend shall conform to the Standard Alphabets published in the FHWA Standard Highway Signs Book. The legend shall be oriented in the same direction in accordance with the manufacturer's orientation marks found on the retroreflective sheeting.

On multiple panel signs, legend shall be placed across joints without affecting the size, shape, spacing, and appearance of the legend. Background and legend shall be wrapped around interior edges of formed panel signs as shown on plans to prevent delamination.

The following notation shall be placed on the lower right side of the back of each sign where the notation will not be blocked by the sign post or frame:

- A. PROPERTY OF STATE OF CALIFORNIA,
- B. Name of the sign manufacturer,
- C. Month and year of fabrication,
- D. Type of retroreflective sheeting, and
- E. Manufacturer's identification and lot number of retroreflective sheeting.

The above notation shall be applied directly to the aluminum sign panels in 6-mm upper case letters and numerals by die-stamp and applied by similar method to the fiberglass reinforced plastic signs. Painting, screening, or engraving the notation will not be allowed. The notation shall be applied without damaging the finish of the sign.

Signs with a protective overlay film shall be marked with a dot of 10 mm diameter. The dot placed on white border shall be black, while the dot placed on black border shall be white. The dot shall be placed on the lower border of the sign before application of the protective overlay film and shall not be placed over the legend and bolt holes. The application method and exact location of the dot shall be determined by the manufacturer of the signs.

For sign panels that have a minor dimension of 1220 mm or less, no splice will be allowed in the retroreflective sheet except for the splice produced during the manufacturing of the retroreflective sheeting. For sign panels that have a minor dimension greater than 1220 mm, only one horizontal splice will be allowed in the retroreflective sheeting.

Unless specified by the manufacturer of the retroreflective sheeting, splices in retroreflective sheeting shall overlap by a minimum of 25 mm. Splices shall not be placed within 50 mm from edges of the panels. Except at the horizontal borders, the splices shall overlap in the direction from top to bottom of the sign to prevent moisture penetration. The retroreflective sheeting at the overlap shall not exhibit a color difference under the incident and reflected light.

Signs exhibiting a significant color difference between daytime and nighttime shall be replaced immediately.

Repairing sign panels will not be allowed except when approved by the Engineer.

The Department will inspect signs at the Contractor's facility and delivery location, and in accordance with Section 6, "Control of Materials," of the Standard Specifications. The Engineer will inspect signs for damage and defects before and after installation.

Regardless of kind, size, type, or whether delivered by the Contractor or by a common carrier, signs shall be protected by thorough wrapping, tarping, or other methods to ensure that signs are not damaged by weather conditions and during transit. Signs shall be dry during transit and shipped on pallets, in crates, or tier racks. Padding and protective materials shall be placed between signs as appropriate. Finished sign panels shall be transported and stored by method that protects the face of signs from damage. The Contractor shall replace wet, damaged, and defective signs.

Signs shall be stored in dry environment at all times. Signs shall not rest directly on the ground or become wet during storage. Signs, whether stored indoor or outdoor, shall be free standing. In areas of high heat and humidity signs shall be stored in enclosed climate-controlled trailers or containers. Signs shall be stored indoor if duration of the storage will exceed 30 days.

Screen processed signs shall be protected, transported and stored as recommended by the manufacturer of the retroreflective sheeting.

When requested, the Contractor shall provide the Engineer test samples of signs and materials used at various stages of production. Sign samples shall be 300 mm x 300 mm in size with applied background, letter or numeral, and border strip.

The Contractor shall assume the costs and responsibilities resulting from the use of patented materials, equipment, devices, and processes for the Contractor's work.

## **SHEET ALUMINUM**

Alloy and temper designations for sheet aluminum shall be in accordance with ASTM Designation: B209.

The Contractor shall furnish the Engineer a Certificate of Compliance in accordance to Section 6-1.07, "Certificates of Compliance," of the Standard Specifications for the sheet aluminum.

Sheet aluminum shall be pretreated in accordance to ASTM Designation: B449. Surface of the sheet aluminum shall be cleaned, deoxidized, and coated with a light and tightly adherent chromate conversion coating free of powdery residue. The conversion coating shall be Class 2 with a mass between 108 mg/m<sup>2</sup> and 377 mg/m<sup>2</sup>, and an average mass of 269 mg/m<sup>2</sup>. Following the cleaning and coating process, the sheet aluminum shall be protected from exposure to grease, oils, dust, and contaminants.

Sheet aluminum shall be free of buckles, warps, dents, cockles, burrs, and defects resulting from fabrication.

Base plate for standard route marker shall be die cut.

## **RETROREFLECTIVE SHEETING**

The Contractor shall furnish retroreflective sheeting for sign background and legend in accordance with ASTM Designation: D4956 and "Prequalified and Tested Signing and Delineation Materials" of these special provisions.

Retroreflective sheeting shall be applied to sign panels as recommended by the retroreflective sheeting manufacturer without stretching, tearing, and damage.

Class 1, 3, or 4 adhesive backing shall be used for Type II, III, IV, VII, VIII, and IX retroreflective sheeting. Class 2 adhesive backing may also be used for Type II retroreflective sheeting. The adhesive backing shall be pressure sensitive and fungus resistant.

When the color of the retroreflective sheeting determined from instrumental testing is in dispute, the Engineer's visual test will govern.

### **PROCESS COLOR AND FILM**

The Contractor shall furnish and apply screened process color, non-reflective opaque black film, and protective overlay film of the type, kind, and product that are approved by the manufacturer of the retroreflective sheeting.

The Contractor shall furnish the Engineer a Certificate of Compliance in accordance to Section 6-1.07, "Certificates of Compliance," of the Standard Specifications for the screened process color, non-reflective opaque black film, and protective overlay film.

The surface of the screened process color shall be flat and smooth. When the screened process colors determined from the instrumental testing in accordance to ASTM Designation: D4956 are in dispute, the Engineer's visual test will govern.

The Contractor shall provide patterns, layouts, and set-ups necessary for the screened process.

The Contractor may use green, red, blue, and brown reverse-screened process colors for background and non-reflective opaque black film or black screened process color for legend. The coefficient of retroreflection for reverse-screened process colors on white retroreflective sheeting shall not be less than 70 percent of the coefficient of retroreflection specified in ASTM Designation: D4956.

The screened process colors and non-reflective opaque black film shall have the same outdoor weatherability as that of the retroreflective sheeting.

After curing, screened process colors shall withstand removal when tested by applying 3M Company Scotch Brand Cellophane Tape No. 600 or equivalent tape over the color and removing with one quick motion at 90°angle.

### **SINGLE SHEET ALUMINUM SIGN**

Single sheet aluminum signs shall be fabricated and furnished with or without frame. The Contractor shall furnish the sheet aluminum in accordance to "Sheet Aluminum" of these special provisions. Single sheet aluminum signs shall be fabricated from sheet aluminum alloy 6061-T6 or 5052-H38.

Single sheet aluminum signs shall not have a vertical splice in the sheet aluminum. For signs with depth greater than 1220 mm, one horizontal splice will be allowed in the sheet aluminum.

Framing for single sheet aluminum sign shall consist of aluminum channel or rectangular aluminum tubing. The framing shall have a length tolerance of +3 mm. The face sheet shall be affixed to the frame with rivets of 5-mm diameter. Rivets shall be placed within the web of channels and shall not be placed less than 13 mm from edges of the sign panels. Rivets shall be made of aluminum alloy 5052 and shall be anodized or treated with conversion coating to prevent corrosion. The exposed portion of rivets on the face of signs shall be the same color as the background or legend where the rivets are placed.

Finished signs shall be flat within a tolerance of +3 mm per meter when measured across the plane of the sign in all directions. The finished signs shall have an overall tolerance within +3 mm of the detailed dimensions.

Aluminum channels or rectangular aluminum tubings shall be welded together with the inert gas shielded-arc welding process using E4043 aluminum electrode filler wires as shown on the plans. Width of the filler shall be equal to wall thickness of smallest welded channel or tubing.

### **FIBERGLASS REINFORCED PLASTIC PANEL SIGN**

The contractor shall furnish fiberglass reinforced plastic panel sign in accordance with ASTM Designation: D3841 and "Prequalified and Tested Signing and Delineation Materials" of these special provisions.

Fiberglass reinforced plastic shall be acrylic modified and ultraviolet stabilized for outdoor weatherability. The plastic shall contain additives designed to suppress fire ignition and flame propagation. When tested in accordance with the requirements in the ASTM Designation: D635, the extent of burning shall not exceed 25 mm.

Fiberglass reinforced plastic shall be stabilized to prevent the release solvents and monomers. The front and back surfaces of the laminate shall be clean and free of constituents and releasing agents that can interfere with the bonding of retroreflective sheeting.

The fiberglass reinforced plastic panel sign shall be weather resistant Grade II thermoset polyester laminate.

The fiberglass reinforced plastic panels shall be minimum 3.4 mm thick. Finished fiberglass reinforced plastic panel signs shall be flat within a tolerance of +3 mm per meter when measured across the plane of the sign in all directions. The finished signs shall have an overall tolerance within +3 mm of the specified dimensions.

Color of fiberglass reinforced plastic panels shall be uniform gray within Munsel range of N7.5 to N8.5.



Fiberglass reinforced plastic panels shall be cut from a single piece of laminate. Bolt holes shall be predrilled. The predrilled bolt holes, panel edges, and the front and back surfaces of the panels shall be true and smooth. The panel surfaces shall be free of visible cracks, pinholes, foreign inclusions, warping and wrinkles that can affect performance and serviceability.

#### LAMINATED PANEL SIGN

Laminated panel signs shall consist of two sheet aluminum laminated to a honeycomb core and extruded aluminum frame to produce flat and rigid panels of 25.4-mm or 63.5-mm nominal thickness.

The face of laminated panel signs shall be fabricated from sheet aluminum alloy 6061-T6 or 5052-H32 of 1.6-mm thickness. The back of laminated panel signs shall be fabricated from sheet aluminum alloy 3003-H14 of 1.0-mm thickness. The Contractor shall furnish sheet aluminum as provided in "Sheet Aluminum" of these special provisions.

The core material shall be phenolic impregnated kraft paper honeycomb and fungus resistant in accordance to Military Specification MIL-D-5272. The honeycomb cell size shall be 13 mm. Weight of the kraft paper shall be 300 g/m<sup>2</sup> and impregnated minimum 18 percent by weight.

A laminating adhesive that can produce a resilient oil and water-resistant bond shall be used to adhere the extruded aluminum frame and the honeycomb core to the sheet aluminum. Edge and interior delamination occur when a 0.25-mm thick feeler gauge of 13 mm in length can be inserted into a depth of more than 13 mm between the extruded aluminum frame and the sheet aluminum. Laminated panel sign with delamination will be rejected.

Laminated panels shall be able to resist a wind load of 161 kg/m<sup>2</sup> for the following simple span lengths with a bending safety factor of 1.25:

Panel Type	Nominal Panel Thickness	Simple Span Length
A	25.4 mm	2.7 m
B	25.4 mm	2.7 m
	63.5 mm	4.42 m
H	63.5 mm	4.42 m

The tensile strength of laminated panels shall be at least 138 kPa when tested in accordance with the following modification and with ASTM Designations: C297 and C481, Cycle B after aging. Instead of spraying with hot water, the specimen shall be totally immersed in 70°C hot water. When requested by the Engineer or the Transportation Laboratory, at least one test sample of 300 mm x 300 mm in size shall be taken for every 186 m<sup>2</sup> of the panel production cycle or of the total factory production order, whichever occurs first.

Rivets used to secure the sheet aluminum to the perimeter frame shall be fabricated from aluminum alloy 5052 and anodized or treated with a conversion coating to prevent corrosion. Size of the aluminum rivets shall be 5 mm in diameter and placed at the corners of the laminated panels. Color of the exposed portion of the rivets shall be the same color as the sign background or legend on which the rivets are placed. Rivets or stainless steel screws shall be placed in holes drilled during fabrication in the perimeter frame.

On laminated multiple panel signs, a closure H-Section shall be placed in the top channel of the bottom panel. Perimeter frame of adjoining panel shall accommodate the closure H-Section in the closed position.

For signs with a depth of 1524 mm or less, the laminated panels shall be fabricated with no horizontal joints, splices or seams. For signs with a depth of greater than 1524 mm, the laminated panels may be fabricated in two panels.

The face of laminated panels shall be flat with a tolerance of +8 mm per meter when measured across the plane of each panel in all directions. Where laminated panels adjoin, the gap between adjoining edges from one corner to the other corner shall not deviate by more than 1 mm. Non-adjoining edges from one corner to the other corner shall not deviate by more than 3 mm from a straight plane. The front and back sheet aluminum shall be flush with the perimeter frame. The panel edges shall be smooth.

Laminated panel signs shall be within +3 mm or -13 mm of the detailed dimensions. The difference in length between adjoining panels of multiple panel signs shall not be greater than 13 mm.

Roadside laminated panel signs shall be Type B or Type H. Type B panels shall have a nominal thickness of 25.4 mm or 63.5 mm. Type H panels shall have a nominal thickness of 63.5 mm.

The perimeter frame of Type B panels shall consist of extruded channel edges. The interior and exterior sides of the channels, except the sides touching the face and back sheet aluminum, shall be welded at the joint. Sealant shall be placed at the corners of the perimeter frame to prevent moisture penetration.

Each side of the vertical tube spacers of Type B panels shall be welded to the perimeter frame, except the sides touching the front and back sheet aluminum.

The perimeter frame of Type H panels shall consist of extruded channel edges on the vertical sides and consist of extruded tube channel edges on the horizontal sides. The perimeter frame shall be connected by self-tapping hex head stainless steel screws. Sealant shall be placed at the corners of the perimeter frame to prevent moisture penetration.

For Type H panels with a length of 5182 mm or longer, centerline panel tube shall be placed along the horizontal centerline of the panel. The ends of the centerline panel tube shall be firmly affixed to the perimeter frame.

Each side of the vertical tube spacers of Type H panels shall be welded to the perimeter frame and the centerline panel tube, except the sides touching the front and back sheet aluminum.

The Contractor shall furnish mounting hardware for roadside laminated panel signs, such as closure H-sections, lags, bolts, nuts, and washers.

### **FORMED PANEL SIGN**

Formed panel signs shall be fabricated from one continuous sheet aluminum alloy 5052-H32 of 1.6-mm thickness. The Contractor shall furnish sheet aluminum as provided in "Sheet Aluminum" of these special provisions.

The aluminum frame shall be affixed to the panel with aluminum rivets through the face of the sign panels. Color of the exposed portion of the rivets shall be the same color as the sign background or legend on which the rivets are placed.

The face of finished formed panel sign shall be flat with a tolerance of 10 mm per meter when measured across the plane of each panel in all directions.

The Contractor shall furnish mounting hardware for roadside formed panel signs. Hardware for the formed panel signs shall include bolts, nuts, and washers.

### **MEASUREMENT AND PAYMENT**

Furnishing signs (except for construction area signs) will be measured by the square meter and the quantity to be paid for will be the total area, in square meters, of the sign panel types installed in place.

The contract price paid per square meter for furnish sign of the types specified in the Engineer's estimate shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in fabricating and furnishing the signs, including fastening hardware, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

Full compensation for furnishing and installing protective overlay on signs shall be considered as included in the contract price paid per square meter for furnish sign of the various types and no separate payment will be made therefor.

### **10-1.112 TIMBER LAGGING**

Timber lagging shall conform to the details shown on the plans and the provisions in Sections 57, "Timber Structures," and 58, "Preservative Treatment of Lumber, Timber and Piling," of the Standard Specifications and these special provisions.

All timber members shall be preservative treated Douglas fir of the grades shown on the plans. Timber members shall be full sawn to the dimensions shown on the plans.

Preservative treatment shall conform to AWPAC Use Category System: UC4B, Commodity Specification A, except that chromated copper arsenate shall not be used.

Timbers shall be installed with mortar-tight joints.

### **10-1.113 CLEAN AND PAINT MISCELLANEOUS FACILITIES**

New metal surfaces for the following facilities shall be cleaned and painted in conformance with the provisions in Section 59-2, "Painting Structural Steel," Section 59-3, "Painting Galvanized Surfaces," and Section 91, "Paint," of the Standard Specifications and these special provisions.

1. Bike path railing and all components
2. Bike path fence and all components.
3. Steel cover plate for barrier and all components
4. Pedestals for future light poles.
5. Bollards.
6. Directional sign posts and frames.
7. Benches.
8. Trash receptacle.

## GENERAL

Before performing any painting or paint removal, the Contractor shall submit to the Engineer, in conformance with the provisions in "Working Drawings" of these special provisions, 3 copies of a separate Painting Quality Work Plan (PQWP) for each item of work for which painting or paint removal is to be performed. As a minimum, each PQWP shall include the following:

1. The name of each Contractor or subcontractor to be used.
2. One copy each of all current ASTM and "SSPC: The Society for Protective Coatings" specifications or qualification procedures applicable to the painting or paint removal to be performed. These documents shall become the permanent property of the Department.
3. A copy of the coating manufacturer's guidelines and recommendations for surface preparation, painting, drying, curing, handling, shipping, and storage of painted structural steel, including testing methods and maximum allowable levels for soluble salts.
4. Proposed materials, methods, and equipment to be used.
5. Proof of each of any required certifications, SSPC-QP 1, SSPC-QP 2, SSPC-QP 3.
  - 5.1. In lieu of certification in conformance with the requirements in SSPC-QP 1 for this project, the Contractor may submit written documentation showing conformance with the requirements in Section 3, "General Qualification Requirements," of SSPC-QP 1.
6. Proposed methods to control environmental conditions in accordance with the manufacturer's recommendations and these special provisions.
7. Proposed methods to protect the coating during curing, shipping, handling, and storage.
8. Proposed rinse water collection plan.
9. A detailed paint repair plan for the repair of damaged areas.
10. Procedures for containing blast media and water during application of coatings and coating repair of erected steel.
11. Examples of proposed daily reports for all testing to be performed, including type of testing, location, lot size, time, weather conditions, test personnel, and results.

Before submitting the PQWP, a prepainting meeting between the Engineer, the Contractor, and a representative from each entity performing painting for this project shall be held to discuss the requirements for the PQWP.

The Engineer shall have 20 days to review the PQWP submittal after a complete plan has been received. No painting or paint removal shall be performed until the PQWP for that work is approved by the Engineer. Should the Engineer fail to complete the review within this time allowance and if, in the opinion of the Engineer, the Contractor's controlling operation is delayed or interfered with by reason of the delay in reviewing the PQWP, the delay will be considered a right of way delay in conformance with the provisions in Section 8-1.09, "Right of Way Delays," of the Standard Specifications.

The Engineer's approval of the Contractor's PQWP shall not relieve the Contractor of any responsibility under the contract for the successful completion of the work in conformity with the requirements of the plans and specifications.

The Contractor shall provide enclosures to permit cleaning and painting during inclement weather. Provisions shall be made to control atmospheric conditions inside the enclosures within specified limits during cleaning and painting operations, drying to solvent insolubility, and throughout the curing period in accordance with the manufacturer's recommendations and these special provisions. Full compensation for providing and maintaining such enclosures shall be considered as included in the prices paid for the various contract items of work requiring paint and no additional compensation will be allowed therefor.

Fresh, potable water with a maximum chloride content of 75 mg/L and a maximum sulfate content of 200 mg/L shall be used for water rinsing or pressure washing operations. No continuous recycling of rinse water will be permitted. If rinse water is collected into a tank and subsequent testing determines the collected water conforms to the specified requirements, reuse may be permitted by the Engineer if no collected water is added to the tank after sample collection for determination of conformance to specified requirements.

## **CLEANING**

New metal surfaces, except where galvanized, shall be dry blast cleaned in conformance with the requirements in SSPC-SP 10, "Near White Blast Cleaning," of the "SSPC: The Society for Protective Coatings." Blast cleaning shall leave surfaces with a dense, uniform, angular anchor pattern of not less than 38 µm nor more than 90 µm as measured in conformance with the requirements in ASTM Designation: D 4417.

Mineral and slag abrasives used for blast cleaning steel surfaces shall conform to the requirements for Class A, Grade 2 to 3 abrasives contained in SSPC-AB 1, "Mineral and Slag Abrasives," of the "SSPC: The Society for Protective Coatings," and shall not contain hazardous material.

Steel abrasives used for blast cleaning steel surfaces shall comply with the requirements of SSPC-AB 3, "Ferrous Metallic Abrasive," of the "SSPC: The Society for Protective Coatings." If steel abrasive is recycled through shop or field abrasive blast cleaning units, the recycled abrasive shall conform to the requirements of SSPC-AB 2, "Specification for Cleanliness of Recycled Ferrous Metallic Abrasive," of the "SSPC: The Society for Protective Coatings."

A Certificate of Compliance conforming to the provisions in Section 6-1.07, "Certificates of Compliance," of the Standard Specifications and a Material Safety Data Sheet shall be furnished before use for each shipment of blast cleaning material for steel.

The inside surfaces of bolt holes shall be cleaned in conformance with the requirements in SSPC-SP 1, "Solvent Cleaning," of the "SSPC: The Society for Protective Coatings," and visible rust shall be removed.

Abrasive blast cleaned surfaces shall be tested by the Contractor for soluble salts using a Class A or B retrieval method as described in Technology Guide 15, "Field Methods for Retrieval and Analysis of Soluble Salts on Steel and other Nonporous Substrates," of the "SSPC: The Society for Protective Coatings," and cleaned so the maximum level of soluble salts does not exceed the lesser of the coating manufacturer's written recommendations or 10 micrograms per square centimeter. Areas of abrasive blast cleaned steel shall be tested at the rate of 3 tests for the first 100 square meters prepared per day, and one test for each additional 100 square meters or portion thereof, at locations selected by the Engineer. When less than 100 square meters of surface area is prepared in a shift, at least 2 tests shall be performed. If levels of soluble salts exceed the maximum allowed by these special provisions, the entire area represented by the testing will be rejected. The Contractor shall perform additional cleaning and testing of rejected areas until soluble salt levels conform to these requirements.

Corners shall be chamfered to remove sharp edges.

Thermal cut edges (TCEs) to be painted shall be conditioned before blast cleaning by shallow grinding or other method approved by the Engineer to remove the thin, hardened layer of material resulting from resolidification during cooling.

Visually evident base metal surface irregularities and defects shall be removed in accordance with ASTM Designation: A 6 or AASHTO Designation: M 160 before blast cleaning steel. When material defects exposed by blast cleaning are removed, the blast profile shall be restored by either blast cleaning or by using mechanical tools in accordance with SSPC-SP 11, "Power Tool Cleaning to Bare Metal," of the "SSPC: The Society for Protective Coatings."

## **PAINTING**

Blast cleaned surfaces shall receive a single undercoat of an inorganic zinc rich primer and a single finish coat of a polysiloxane paint approved by the manufacturer of the inorganic zinc coating.

The inorganic zinc rich primer shall conform to the requirements in AASHTO Designation: M 300, Type I or Type II, except that:

1. The first 3 sentences of Section 5.6, "Primer Field Performance Requirements," shall not apply for Type II primers, and
2. The entire Section 5.6.1 shall not apply for either type of inorganic zinc primer.

Type I primers selected for use shall meet the current applicable volatile organic compound limits for the air district in which the project is located.

Inorganic zinc rich primer shall be selected from the Department's Pre-Qualified Products List.

The inside surfaces of bolt holes shall be painted with one application of a zinc rich primer (organic vehicle type) after the application of the undercoat of inorganic zinc on adjacent steel. The steel surfaces adjacent to the bolt holes shall be kept clean and protected from drippings during the application of the primer.

The color of the final application of inorganic zinc rich primer shall match color no. 36373 of FTD-STD-595.

Inorganic zinc rich primer shall be used within 12 hours of initial mixing.

Application of inorganic zinc rich primer shall conform to the provisions in Section 59-2.13, "Application of Zinc-Rich Primer," of the Standard Specifications.

The single undercoat of inorganic zinc rich primer shall be applied to the required dry film thickness in 2 or more applications within 8 hours of the start of blast cleaning. Abrasive blast cleaned steel shall not be exposed to relative humidity exceeding 85 percent before application of inorganic zinc primer.

The total dry film thickness of all applications of the inorganic zinc undercoat, including the surfaces of outside existing members within the grip under bolt heads, nuts, and washers, shall be not less than 100  $\mu\text{m}$  nor more than 200  $\mu\text{m}$ , except that the total dry film thickness on each faying (contact) surface of high strength bolted connections shall be between 25  $\mu\text{m}$  and the maximum allowable dry film thickness for Class B coatings as determined by certified testing in conformance with Appendix A of the "Specification for Structural Joints Using ASTM A325 or A490 Bolts" of the Research Council on Structural Connections (RCSC Specification). Unless otherwise stated, all inorganic zinc rich primer used on faying surfaces shall meet the slip coefficient requirements for a Class B coating on blast-cleaned steel, as specified in the RCSC Specification. The Contractor shall provide results of certified testing showing the maximum allowable dry film thickness for the Class B coating from the qualifying tests for the coating chosen, and shall maintain the coating thickness on actual faying surfaces of the structure at or below this maximum allowable coating thickness.

Areas where mudcracking occurs in the inorganic zinc coating shall be blast cleaned and repainted with inorganic zinc rich primer to the specified thickness.

Steel surfaces coated with Type II inorganic zinc rich primer shall be protected from conditions that may cause the coating film to dissolve. The Contractor, at the Contractor's expense, shall repair areas where the coating has dissolved by blast cleaning and repainting with inorganic zinc rich primer to the specified thickness.

Dry spray, or overspray, as defined in the Steel Structures Painting Manual, Volume 1, "Good Painting Practice," of the "SSPC: The Society for Protective Coatings," shall be removed before application of subsequent coats or final acceptance. Removal of dry spray shall be by screening or other methods that minimize polishing of the inorganic zinc surface. The dry film thickness of the coating after removal of dry spray shall be in conformance with the provisions for applying the single undercoat, as specified herein.

The Contractor shall test the inorganic zinc rich primer before application of finish coats. The locations of the tests will be determined by the Engineer. The Contractor shall determine the sequence of the testing operations. The testing for adhesion and hardness shall be performed no sooner than 72 hours after application of the single undercoat of inorganic zinc rich primer. Satisfactory access shall be provided to allow the Engineer to determine the location of the tests.

The inorganic zinc undercoat shall pass the following tests:

1. The undercoat shall have a minimum adhesion to steel of 4.0 MPa when measured using a self-aligning adhesion tester in conformance with the requirements in ASTM Designation: D 4541. The Engineer will select 3 locations per girder or 100 square meters of painted surface, whichever is less, for adhesion testing. If less than 100 square meters of steel is painted in a work shift, the Engineer will select 3 areas painted during the work shift for testing. If 2 or more of the locations tested fail to meet adhesion requirements, the entire area represented by the tests will be rejected. If one of the locations tested fails to meet adhesion requirements, an additional 3 locations shall be tested. Should any of the additional locations fail to meet adhesion requirements, the entire area represented by the tests will be rejected. The Contractor, at the Contractor's expense, shall repair the rejected area by blast cleaning and repainting with inorganic zinc rich primer to the specified thickness. Test locations for areas of inorganic zinc meeting adhesion testing requirements shall be repaired by application of organic zinc primer as specified in Section 91-1.04, "Materials," of the Standard Specifications to the specified minimum dry film thickness.
2. Areas where finish coats are to be applied shall be tested by the Contractor for soluble salts using a cell retrieval method as described in Technology Guide 15, "Field Methods for Retrieval and Analysis of Soluble Salts on Steel and other Nonporous Substrates," of the "SSPC: The Society for Protective Coatings," and cleaned so the maximum level of soluble salts does not exceed the lesser of the manufacturer's written recommendations or 10 micrograms per square centimeter. Areas of inorganic zinc undercoat shall be tested at the rate of 3 tests for the first 100 square meters to be painted per day and one test for each additional 100 square meters or portion thereof at locations selected by the Engineer. When less than 100 square meters of surface area is painted in a shift, at least 2 tests shall be performed. If levels of soluble salts exceed the maximum allowed by these special provisions, the entire area represented by the testing will be rejected. The Contractor shall perform additional cleaning and testing of rejected areas until soluble salt levels conform to these requirements.
3. Before application of finish coats, the inorganic zinc undercoat shall exhibit a solid, hard, and polished metal surface when firmly scraped with the knurled edge of a quarter. Inorganic zinc coating that is powdery, soft, or does not exhibit a polished metal surface, as determined by the Engineer, shall be repaired by the Contractor, at the Contractor's expense, by blast cleaning and repainting with inorganic zinc rich primer to the specified thickness.

### **Additional Requirements for Water Borne Inorganic Zinc Primers**

1. The surface pH of the inorganic zinc undercoat shall be tested by wetting the surface with de-ionized water for a minimum of 15 minutes but no longer than 30 minutes and applying pH paper with a capability of measuring in increments of 0.5 pH units. At least 2 surface pH readings shall be taken for every 50 square meters or portion thereof. If less than 50 square meters of steel is coated in a single shift or day, at least 2 surface pH readings shall be taken for primer applied during that period. Application of finish coats will not be permitted until the surface pH is less than or equal to 7.
2. Dry to solvent insolubility for water borne inorganic zinc primers shall be determined in conformance with the requirements in ASTM Designation: D 4752, except that water shall be the solvent. The resistance rating shall be not less than 4. Areas of inorganic zinc undercoat shall be tested for solvent insolubility at the rate of one test per 50 square meters or portion thereof. Inorganic zinc undercoat represented by the tested area that does not meet the solvent insolubility requirements will be rejected. The Contractor, at the Contractor's expense, shall repair rejected areas by blast cleaning and repainting with inorganic zinc rich primer to the specified thickness.

### **Additional Requirements for Solvent Borne Inorganic Zinc Primers**

1. Dry to solvent insolubility for solvent borne inorganic zinc primers shall be determined in conformance with the requirements in ASTM Designation: D 4752. The resistance rating shall be not less than 4. Areas of inorganic zinc undercoat shall be tested for solvent insolubility at the rate of one test per 50 square meters or portion thereof. Inorganic zinc undercoat represented by the tested area that does not meet the solvent insolubility requirements will be rejected. The Contractor, at the Contractor's expense, shall repair rejected areas by blast cleaning and repainting with inorganic zinc rich primer to the specified thickness.
2. Surface hardness of solvent borne inorganic zinc undercoat shall be a minimum 2H when measured in conformance with the requirements in ASTM Designation: D 3363. Areas of inorganic zinc undercoat shall be tested at the rate of one test per 50 square meters or portion thereof. Inorganic zinc undercoat that fails to meet the surface hardness requirements shall be repaired by the Contractor, at the Contractor's expense, by blast cleaning and repainting with inorganic zinc rich primer to the specified thickness.

The Contractor, at the Contractor's expense, shall retest all rejected areas of the inorganic zinc undercoat after repairs have been completed.

All areas of inorganic zinc undercoat, shall be water rinsed in conformance with the requirements in Section 59-1.03, "Application," of the Standard Specifications and these special provisions. Areas of the coating removed by water rinsing shall be reapplied in conformance with Section 59-2.13, "Application of Zinc-Rich Primer," of the Standard Specifications and these special provisions. Except as approved by the Engineer, a minimum time of 72 hours shall be allowed between application of inorganic zinc rich coating and water rinsing.

The single finish coat shall be an inorganic thermosetting hybrid coating based upon a polysiloxane resin coreacted or blended with an epoxy, acrylic, or urethane resin or combination thereof. The coating shall not contain any isocyanate or polyisocyanate components.

The surface of the undercoat shall be free from moisture, visible dust, visible grease, or other deleterious materials immediately before application of finish paint.

Galvanized or metallized surfaces designated to receive finish paint shall be cleaned in accordance with the requirements of SSPC-SP 1, "Solvent Cleaning," of the "SSPC: The Society for Protective Coatings," and then primed with a galvanized surface primer recommended by the manufacturer of the polysiloxane finish paint. The complete finish paint system on galvanized fasteners shall have a minimum adhesion rating of 4 when measured in accordance with ASTM Designation: D 3359.

The finish coat paint shall be formulated for application to inorganic zinc coating and shall conform to the following:

Test	Test Method	Requirement
Solvent Resistance (100 double rubs with Methyl Ethyl Ketone)	ASTM D 5402	No visible topcoat on cloth, no softening (ASTM D 3363)
Adhesion to primed steel	ASTM D 4541 (Type III, IV, or V)	5.0 MPa, minimum
Adhesion to Galvanized steel	ASTM D 3359, Procedure A (surface cleaned per SSPC-SP 1 and primed with manufacturer's recommended galvanized surface primer)	4 A, minimum
Dry-Through time	ASTM D 1640	8 hours, maximum
Abrasion Resistance (1,000 cycles, CS17 wheel, 1 Kg load)	ASTM D 4060	< 0.125 g loss
Mandrel Bend	ASTM D 522 (125 µm dry film applied to abraded steel plate)	No cracking on 12.7-mm mandrel
Water Resistance	ASTM D 870 (125 µm dry film on primed steel, cured 7 days)	No change in color or gloss after 7 days. Adhesion greater than 4.1 MPa after 48 hours recovery

In addition, the finish coat paint shall conform to the following requirements after exposure for 4,000 hours in conformance with the test procedures in ASTM Designation: D 4587, Cycle 2:

Test	Test Method	Requirement
Color retention	ASTM D 2244 (Color change in $\Delta E^*$ )	< 2.0
Gloss reduction from original reading	ASTM D 523	10 percent, maximum

The finish coat shall be applied within 48 hours following water rinsing and passing the soluble salt testing requirements herein.

The finish coat shall be applied in 2 applications. The first application shall consist of a spray applied mist application. The second application shall be applied after the mist application has dried to a set to touch condition as determined by the procedure described in Section 7 of ASTM Designation: D 1640. The finish coat color shall be equal blend of Federal Standard colors # 27925 and #27880. The total dry film thickness of both applications of the finish coat shall be not less than 125 µm.

Attention is directed to "Supplemental Project Information" of these special provisions regarding referee samples of the Federal Standard colors #27925 and #27880. A test panel at least 600 mm x 600 mm in size shall be successfully completed at a location approved by the Engineer before beginning work on painting steel surfaces. The test panel shall be steel or other material as approved by the Engineer and shall be adequately cleaned. The test panel shall be painted with 2 applications of finish coat using the materials, equipment and methods to be used in painting steel surfaces. If ordered by the Engineer, additional test panels shall be provided until the specified color is obtained, as determined by the Engineer.

The test panel approved by the Engineer shall be used as the standard of comparison in determining acceptability of painted steel surfaces.

The total dry film thickness of all applications of inorganic zinc undercoat and finish coat paint shall be not less than 200 µm nor more than 325 µm.

The exterior visible surfaces of the stainless steel base plates for the bike path railing and fence, the vertical toe plate at the bike path fence and miscellaneous exposed fastener heads shall be painted with shop applied primer and finish coats.

Stainless steel surfaces to receive paint shall be cleaned in conformance with the requirements in SSPC—SP 2, "Hand Tool Cleaning" or SP 3, "Power Tool Cleaning" of the "SSPC: The Society for Protective Coatings."

Grind welds to a smooth, flat surface before painting.

After erection of the stainless steel components and prior to applying the finish coat on these components, apply a solvent based organic zinc-rich epoxy repair coating to touch up any voids, pinholes, corroded metal, bare metal or

other imperfections. The repair coating shall be selected and applied in conformance with the recommendations of the manufacturer of the polysiloxane finish coating.

Cleaned surfaces shall receive a single undercoat of a polymeric epoxy amine primer and a single finish coat of a polysiloxane paint approved by the manufacturer of the primer. The primer shall be applied to a dry film thickness of not less than 100  $\mu\text{m}$  nor greater than 150  $\mu\text{m}$ . The polysiloxane finish coat shall be in conformance with that specified for miscellaneous facilities in these special provisions and applied to a dry film thickness of not less than 75  $\mu\text{m}$  nor greater than 125  $\mu\text{m}$ .

Full compensation for cleaning and painting of miscellaneous facilities as specified in these special provisions shall be considered as included in the contract prices paid for the items of work involved and no separate payment will be made therefor.

#### **10.1.114 CLEAN AND PAINT STEEL SOLDIER PILING**

Steel piling surfaces shall be cleaned and painted in conformance with the provisions in Sections 59-2, "Painting Structural Steel," and 91, "Paint," of the Standard Specifications and these special provisions. Limits of the steel piling surfaces to be dry blast cleaned and shop primed with the inorganic zinc coating shall be as shown on the plans.

Clean and paint steel soldier piling shall consist of dry blast cleaning and painting steel soldier piles with an inorganic zinc undercoat prior to pile installation.

#### **GENERAL**

Proof of certification under the SSPC QP Certification Program must be submitted with your bid. Required certifications are as follows:

1. SSPC-QP 3, Enclosed Shop Facility or AISC Sophisticated Paint Endorsement Quality Program, P1-Enclosed

Prior to performing any painting or paint removal, the Contractor shall submit to the Engineer, in conformance with the provisions in "Working Drawings" of these special provisions, 3 copies of a separate Painting Quality Work Plan (PQWP) for each item of work for which painting or paint removal is to be performed. As a minimum, each PQWP shall include the following:

1. The name of each Contractor or subcontractor to be used.
2. One copy each of all current "SSPC: The Society for Protective Coatings" specifications or qualification procedures applicable to the painting or paint removal to be performed. These documents shall become the permanent property of the Department.
3. A copy of the coating manufacturer's guidelines and recommendations for surface preparation, painting, drying, curing, handling, shipping, and storage of painted structural steel, including testing methods and maximum allowable levels for soluble salts.
4. Proposed methods and equipment to be used.
5. Proof of each of any required certifications, SSPC-QP 3.
6. Proposed methods to control environmental conditions in accordance with the manufacturer's recommendations and these special provisions.
7. Proposed methods to protect the coating during curing, shipping, handling, and storage.
8. Proposed rinse water collection plan.
9. A detailed paint repair plan for the repair of damaged areas.
10. Procedures for containing blast media and water during application of coatings and coating repair of erected steel.
11. Examples of proposed daily reports for all testing to be performed, including type of testing, location, lot size, time, weather conditions, test personnel, and results.

The Engineer shall have 20 days to review the PQWP submittal after a complete plan has been received. No painting or paint removal shall be performed until the PQWP for that work is reviewed by the Engineer. Should the Engineer fail to complete the review within this time allowance and if, in the opinion of the Engineer, the Contractor's controlling operation is delayed or interfered with by reason of the delay in reviewing the PQWP, the delay will be considered a right of way delay in conformance with the provisions in Section 8-1.09, "Right of Way Delays," of the Standard Specifications.



The Engineer's review of the Contractor's PQWP shall not relieve the Contractor of any responsibility under the contract for the successful completion of the work in conformity with the requirements of the plans and specifications.

The Contractor shall provide enclosures to permit cleaning and painting during inclement weather. Provisions shall be made to control atmospheric conditions inside the enclosures within suitable limits during cleaning and painting operations, drying to solvent insolubility, and throughout the curing period in accordance with the manufacturer's recommendations and these special provisions. Full compensation for providing and maintaining such enclosures shall be considered as included in the prices paid for the various contract items of work requiring paint and no additional compensation will be allowed therefor.

Fresh, potable water with a maximum chloride content of 75 mg/L and a maximum sulfate content of 200 mg/L shall be used for water rinsing or pressure washing operations. No continuous recycling of rinse water will be permitted. If rinse water is collected into a tank and subsequent testing determines the collected water conforms to the specified requirements, reuse may be permitted by the Engineer if no collected water is added to the tank after sample collection for determination of conformance to specified requirements.

## **CLEANING**

All designated piling surfaces to be blast cleaned shall be dry blast cleaned in conformance with the requirements of SSPC-SP 10, "Near White Blast Cleaning," of the "SSPC: The Society for Protective Coatings." Blast cleaning shall leave all surfaces with a dense, uniform, angular, anchor pattern of not less than 38  $\mu$ m nor more than 90  $\mu$ m as measured in conformance with the requirements in ASTM Designation: D 4417.

Mineral and slag abrasives used for blast cleaning steel surfaces shall conform to the requirements for Class A, Grade 2 to 3 abrasives contained in SSPC-AB 1, "Mineral and Slag Abrasives," of the "SSPC: The Society for Protective Coatings," and shall not contain hazardous material.

Steel abrasives used for blast cleaning steel surfaces shall comply with the requirements in SSPC-AB 3, "Ferrous Metallic Abrasive," of the "SSPC: The Society for Protective Coatings." If steel abrasive is recycled through shop or field abrasive blast cleaning units, the recycled abrasive shall conform to the requirements of SSPC-AB 2, "Specification for Cleanliness of Recycled Ferrous Metallic Abrasive," of the "SSPC: The Society for Protective Coatings."

A Certificate of Compliance conforming to the provisions in Section 6-1.07, "Certificates of Compliance," of the Standard Specifications and a Material Safety Data Sheet shall be furnished prior to use for each shipment of blast cleaning material to be used on steel.

Abrasive blast cleaned surfaces shall be tested by the Contractor for soluble salts using a Class A or B retrieval method as described in Technology Guide 15, "Field Methods for Retrieval and Analysis of Soluble Salts on Steel and Other Nonporous Substrates," of the "SSPC: The Society for Protective Coatings," and cleaned so the maximum level of soluble salts does not exceed the lesser of the coating manufacturer's written recommendations or 10 micrograms per square centimeter. Areas of abrasive blast cleaned steel shall be tested at the rate of 3 tests for the first 100 square meters prepared per day, and one test for each additional 100 square meters or portion thereof, at locations selected by the Engineer. When less than 100 square meters of surface area is prepared in a shift, at least 2 tests shall be performed. If levels of soluble salts exceed the maximum allowed by these special provisions, the entire area represented by the testing will be rejected. The Contractor shall perform additional cleaning and testing of rejected areas until soluble salt levels conform to these requirements.

## **PAINTING**

Blast cleaned surfaces shall receive a single undercoat where specified or shown on the plans, consisting of an inorganic zinc coating conforming to the requirements in AASHTO Designation: M 300, Type I or Type II, except that (1) the first 3 sentences of Section 4.7, "Primer Field Performance Requirements," shall not apply for Type II coatings and (2) the entire Section 4.7.1 shall not apply for either type of inorganic zinc coating.

Type I primers selected for use shall meet the current applicable volatile organic compound limits for the air district in which the project is located.

Inorganic zinc rich primer shall be selected from the Department's Pre-Qualified Products List.

The color of the final application of inorganic zinc coating shall match color no. 36373 of FTD-STD-595.

Inorganic zinc coating shall be used within 12 hours of initial mixing.

Application of inorganic zinc coating shall conform to the provisions for applying zinc-rich coating in Section 59-2.13, "Application of Zinc-Rich Primer," of the Standard Specifications.

The single undercoat of inorganic zinc coating shall be applied to the required dry film thickness in 2 or more applications within 8 hours of the start of blast cleaning. Abrasive blast cleaned steel shall not be exposed to relative humidity exceeding 85 percent prior to application of the inorganic zinc coating.

The total dry film thickness of all applications of the single undercoat of inorganic zinc coating shall be not less than 100  $\mu\text{m}$  nor more than 200  $\mu\text{m}$ .

Areas where mudcracking occurs in the inorganic zinc coating shall be blast cleaned and repainted with inorganic zinc coating to the specified thickness.

Steel surfaces coated with Type II inorganic zinc coating shall be protected from conditions that may cause the coating film to dissolve. The Contractor, at the Contractor's expense, shall repair areas where the coating has dissolved by blast cleaning and repainting with inorganic zinc coating to the specified thickness.

Dry spray, or overspray, as defined in the Steel Structures Painting Manual, Volume 1, "Good Painting Practice," of the "SSPC: The Society for Protective Coatings," shall be removed prior to application of subsequent coats or final acceptance. Removal of dry spray shall be by screening or other methods that minimize polishing of the inorganic zinc surface. The dry film thickness of the coating after removal of dry spray shall be in conformance with the provisions for applying the single undercoat, as specified herein.

The Contractor shall test the inorganic zinc coating prior to placing any structure backfill (soldier pile wall) behind the wall. The locations of the tests will be determined by the Engineer. The sequence of the testing operations shall be determined by the Contractor. The testing for adhesion and hardness will be performed no sooner than 72 hours after application of the single undercoat of inorganic zinc coating. Satisfactory access shall be provided to allow the Engineer to determine the location of the tests.

The inorganic zinc coating shall pass the following test:

1. The inorganic zinc coating shall have a minimum adhesion to steel of 4.0 MPa when measured at no more than 3 locations on each pile using a self-aligning adhesion tester in conformance with the requirements in ASTM Designation: D 4541. If 2 or more of the locations tested fail to meet adhesion requirements, the entire area represented by the tests will be rejected. If one of the locations tested fails to meet adhesion requirements, an additional 3 locations shall be tested. Should any of the additional locations fail to meet adhesion requirements, the entire area represented by the tests will be rejected. The Contractor, at the Contractor's expense, shall repair the rejected area by blast cleaning and repainting with inorganic zinc to the specified thickness. Test locations for areas of inorganic zinc meeting adhesion testing requirements shall be repaired by application of organic zinc primer as specified in Section 91-1.04, "Materials," of the Standard Specifications to the specified minimum dry film thickness.

#### **Additional Requirements for Water Borne Inorganic Zinc Primers**

1. The surface pH of the inorganic zinc primer shall be tested by wetting the surface with deionized water for a minimum of 15 minutes but no longer than 30 minutes and applying pH paper with a capability of measuring in increments of 0.5 pH units. At least 2 surface pH readings shall be taken for every 50 square meters or portion thereof. If less than 50 square meters of steel is coated in a single shift or day, at least 2 surface pH readings shall be taken for primer applied during that period. Application of finish coats will not be permitted until the surface pH is less than or equal to 7.
2. Dry to solvent insolubility for water borne inorganic zinc primers shall be determined in conformance with the requirements in ASTM Designation: D 4752, except that water shall be the solvent. The resistance rating shall be not less than 4. Areas of inorganic zinc coating shall be tested for solvent insolubility at the rate of one test per 50 square meters or portion thereof. Inorganic zinc coating represented by the tested area that does not meet the solvent insolubility requirements will be rejected. The Contractor, at the Contractor's expense, shall repair rejected areas by blast cleaning and repainting with inorganic zinc coating to the specified thickness.

#### **Additional Requirements for Solvent Borne Inorganic Zinc Primers**

1. Dry to solvent insolubility for solvent borne inorganic zinc primers shall be determined in conformance with the requirements in ASTM Designation: D 4752. The resistance rating shall be not less than 4. Areas of inorganic zinc coating shall be tested for solvent insolubility at the rate of one test per 50 square meters or portion thereof. Inorganic zinc coating represented by the tested area that does not meet the solvent insolubility requirements will be rejected. The Contractor, at the Contractor's expense, shall repair rejected areas by blast cleaning and repainting with inorganic zinc coating to the specified thickness.

2. Surface hardness of solvent borne inorganic zinc shall be a minimum 2H when measured in conformance with the requirements in ASTM Designation: D 3363. Areas of inorganic zinc coating shall be tested at the rate of one test per 50 square meters or portion thereof. Inorganic zinc coating that fails to meet the surface hardness requirements shall be repaired by the Contractor, at the Contractor's expense, by blast cleaning and repainting with inorganic zinc coating to the specified thickness.

The Contractor, at the Contractor's expense, shall retest all rejected areas of inorganic zinc coating after repairs have been completed.

## **REPAIR**

Shop waterborne inorganic zinc coated surfaces of piling that are abraded or damaged at any time after the application of the shop coat shall be repaired prior to installation. If the repair area exceeds one percent of the total coated surface as determined by the Engineer, the Contractor shall repair the surface by blast cleaning and painting the surface with inorganic zinc coating as previously specified. If the repair area is less than one percent of the total coated surface, the Contractor will be permitted to repair the area by thoroughly wire brushing the damaged areas and removing all loose and cracked coating, after which the cleaned areas shall be painted with 2 applications of unthinned zinc-rich primer (organic vehicle type) conforming to the provisions in Section 91, "Paint," of the Standard Specifications. Repair of abraded or damaged surfaces shall be at the Contractor's expense. Aerosol cans shall not be used.

## **PAYMENT**

The contract lump sum price paid for clean and paint steel soldier piling shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in cleaning and painting piling, complete in place, including water rinsing, testing of inorganic zinc coating, and the protecting, cleaning and repair of surfaces prior to and after pile installation, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

### **10-1.115 CLEAN AND PAINT JOINT SEAL ASSEMBLIES, PTFE BEARINGS AND RESTRAINER UNITS (BAR TYPE)**

Joint seal assemblies, PTFE bearings and restrainer units (bar type) shall be cleaned and painted with a single coat of inorganic zinc in conformance with the provisions in Sections 59-2, "Painting Structural Steel," 59-3, "Painting Galvanized Surfaces," and 91, "Paint," of the Standard Specifications and these special provisions.

Prior to performing any painting, the Contractor shall submit to the Engineer, in conformance with the provisions in "Working Drawings" of these special provisions, 3 copies of a separate Painting Quality Work Plan (PQWP) for each item of work for which painting is to be performed. As a minimum, each PQWP shall include the following:

- A. The name of each Contractor or subcontractor to be used.
- B. One copy each of all current ASTM and "SSPC: The Society for Protective Coatings" specifications or qualification procedures applicable to the painting or paint removal to be performed. These documents shall become the permanent property of the Department.
- C. A copy of the coating manufacturer's guidelines and recommendations for surface preparation, painting, drying, curing, handling, shipping, and storage of painted structural steel, including testing methods and maximum allowable levels for soluble salts.
- D. Proposed methods and equipment to be used for paint application.
- E. Proposed methods to control environmental conditions in accordance with the manufacturer's recommendations and these special provisions.
- F. Proposed methods to protect the coating during curing, shipping, handling, and storage.
- G. A detailed paint repair plan for the repair of damaged areas.
- H. Proof of SSPC-QP 3 certification. Certification of AISC Sophisticated Paint Endorsement Quality Program will be considered equivalent to SSPC-QP 3.

The Engineer shall have 14 days to review the PQWP submittal after a complete plan has been received. No painting shall be performed until the PQWP for that work is approved by the Engineer. Should the Engineer fail to complete the review within this time allowance and if, in the opinion of the Engineer, the Contractor's controlling operation is delayed or interfered with by reason of the delay in reviewing the PQWP, the delay will be considered a right of way delay in conformance with the provisions in Section 8-1.09, "Right of Way Delays," of the Standard Specifications.

Fresh, potable water with a maximum chloride content of 75 ppm and a maximum sulfate content of 200 ppm shall be used for water rinsing or pressure washing operations. No continuous recycling of rinse water will be permitted. If rinse water is collected into a tank and subsequent testing determines the collected water conforms to the specified requirements, reuse may be permitted by the Engineer if no collected water is added to the tank after sample collection for determination of conformance to specified requirements.

Metal surfaces to be painted shall be dry blast cleaned in conformance with the requirements in SSPC-SP 10, "Near White Blast Cleaning," of the "SSPC: The Society for Protective Coatings." Blast cleaning shall leave surfaces with a dense, uniform, angular anchor pattern of not less than 40  $\mu\text{m}$  nor more than 86  $\mu\text{m}$  as measured in conformance with the requirements in ASTM Designation: D 4417.

Mineral and slag abrasives used for blast cleaning metal surfaces shall conform to the requirements for Class A, Grade 2 to 3 abrasives contained in SSPC-AB 1, "Mineral and Slag Abrasives," of the "SSPC: The Society for Protective Coatings," and shall not contain hazardous material.

Steel abrasives used for blast cleaning metal surfaces shall comply with the requirements of SSPC-AB 3, "Ferrous Metallic Abrasive," of the "SSPC: The Society for Protective Coatings." If steel abrasive is recycled through shop or field abrasive blast cleaning units, the recycled abrasive shall conform to the requirements of SSPC-AB 2, "Specification for Cleanliness of Recycled Ferrous Metallic Abrasive," of the "SSPC: The Society for Protective Coatings."

A Certificate of Compliance conforming to the provisions in Section 6-1.07, "Certificates of Compliance," of the Standard Specifications and a Material Safety Data Sheet shall be furnished prior to use for each shipment of blast cleaning material.

Abrasive blast cleaned surfaces shall be tested by the Contractor for soluble salts using a Class A or B retrieval method as described in Technology Guide 15, "Field Methods for Retrieval and Analysis of Soluble Salts on Steel and Other Nonporous Substrates," of the "SSPC: The Society for Protective Coatings," and cleaned so the maximum level of soluble salts does not exceed the lesser of the coating manufacturer's written recommendations or 10 micrograms per square centimeter. Each joint seal assembly, PTFE bearing and restrainer unit shall be tested for soluble salts. If levels of soluble salts exceed the maximum allowed by these special provisions, the Contractor shall perform additional cleaning and testing of blast cleaned surfaces until soluble salt levels conform to these requirements.

Corners shall be chamfered to remove sharp edges.

Thermal cut edges (TCEs) to be painted shall be conditioned before blast cleaning by shallow grinding or other method approved by the Engineer to remove the thin, hardened layer of material resulting from resolidification during cooling.

Visually evident base metal surface irregularities and defects shall be removed in accordance with ASTM Designation: A 6 or AASHTO Designation: M 160 prior to blast cleaning steel. When material defects exposed by blast cleaning are removed, the blast profile shall be restored by either blast cleaning or by using mechanical tools in accordance with SSPC-SP 11, "Power Tool Cleaning to Bare Metal," of the "SSPC: The Society for Protective Coatings."

Blast cleaned surfaces shall receive a single undercoat, and a final coat where specified, consisting of an inorganic zinc coating conforming to the requirements in AASHTO Designation: M 300, Type I or Type II, except that:

1. The first 3 sentences of Section 5.6, "Primer Field Performance Requirements," shall not apply for Type II coatings, and
2. The entire Section 5.6.1 shall not apply for either type of inorganic zinc coating.

If the Contractor proposes to use a Type I coating, the Contractor shall furnish to the Engineer for review documentation as required in Section 5.6 of AASHTO Designation: M 300. The Contractor shall allow the Engineer 14 days to review the proposal.

If the Contractor proposes to use a Type II coating, the coating shall be selected from the qualified products list, which may be obtained from the Transportation Laboratory.

The color of the inorganic zinc coating shall match Federal Standard 595B, No. 36373.

Inorganic zinc coating shall be used within 12 hours of initial mixing.

Stainless steel surfaces of PTFE bearings shall be masked off completely prior to application of inorganic zinc coating.

Application of inorganic zinc coating shall conform to the provisions for applying zinc-rich coating in Section 59-2.13, "Application of Zinc-Rich Primer," of the Standard Specifications.

The single coat of inorganic zinc coating shall be applied to the required dry film thickness in 2 or more applications within 8 hours of the start of blast cleaning. Abrasive blast cleaned steel shall not be exposed to relative humidity exceeding 85 percent prior to application of inorganic zinc.

The total dry film thickness of all applications of inorganic zinc, including the surfaces of outside existing members within the grip under bolt heads, nuts, and washers, shall be not less than 100 µm nor more than 200 µm, except that the total dry film thickness on each faying (contact) surface of high strength bolted connections shall be between 25 µm and the maximum allowable dry film thickness for Class B coatings as determined by certified testing in conformance with Appendix A of the "Specification for Structural Joints Using ASTM A325 or A490 Bolts" of the Research Council on Structural Connections (RCSC Specification). Unless otherwise stated, all inorganic zinc coatings used on faying surfaces shall meet the slip coefficient requirements for a Class B coating on blast-cleaned steel, as specified in the RCSC Specification. The Contractor shall provide results of certified testing showing the maximum allowable dry film thickness for the Class B coating from the qualifying tests for the coating chosen, and shall maintain the coating thickness on actual faying surfaces of the structure at or below this maximum allowable coating thickness.

Areas where mudcracking occurs in the inorganic zinc coating shall be blast cleaned and repainted with inorganic zinc coating to the specified thickness.

Metal surfaces coated with Type II inorganic zinc coating shall be protected from conditions that may cause the coating film to dissolve. The Contractor, at the Contractor's expense, shall repair areas where the coating has dissolved by blast cleaning and repainting with inorganic zinc coating to the specified thickness.

Dry spray, or overspray, as defined in the Steel Structures Painting Manual, Volume 1, "Good Painting Practice," of the "SSPC: The Society for Protective Coatings," shall be removed prior to application of subsequent coats or final acceptance. Removal of dry spray shall be by screening or other methods that minimize polishing of the inorganic zinc surface. The dry film thickness of the coating after removal of dry spray shall be in conformance with the provisions for applying the single undercoat, as specified herein.

The Contractor shall test the inorganic zinc coating at locations determined by the Engineer. The Contractor shall determine the sequence of the testing operations. The testing for adhesion and hardness shall be performed no sooner than 72 hours after application of the inorganic zinc coating. Satisfactory access shall be provided to allow the Engineer to determine the location of the tests.

The inorganic zinc coating shall pass the following tests:

- A. The inorganic zinc coating shall have a minimum adhesion to steel of 4 MPa when measured using a self-aligning adhesion tester in conformance with the requirements in ASTM Designation: D 4541. Adhesion testing shall conform to the following requirements:
  1. The Engineer shall select two locations per bearing, two locations per joint seal assembly and two locations per restrainer unit for adhesion testing. If either of the locations tested fails to meet adhesion requirements, the respective units will be rejected.
  2. The Contractor, at the Contractor's expense, shall repair the rejected item by blast cleaning and repainting with inorganic zinc to the specified thickness. Test locations for areas of inorganic zinc meeting adhesion testing requirements shall be repaired by application of organic zinc primer as specified in Section 91-1.04, "Materials," of the Standard Specifications to the specified minimum dry film thickness.
- B. The inorganic zinc coating shall exhibit a solid, hard, and polished metal surface when firmly scraped with the knurled edge of a quarter. Inorganic zinc coating that is powdery, soft, or does not exhibit a polished metal surface shall be repaired by the Contractor, at the Contractor's expense, by blast cleaning and repainting with inorganic zinc coating to the specified thickness.
- C. Dry to solvent insolubility for inorganic zinc primers shall be determined in conformance with the requirements in ASTM Designation: D 4752, except that water shall be the solvent used for testing of water borne inorganic zinc primers. The resistance rating shall be not less than 4. Each bearing, joint seal assembly and restrainer unit shall be tested for dry to solvent insolubility. Inorganic zinc coating that does not meet the solvent insolubility requirements shall be repaired by the Contractor, at the Contractor's expense, by blast cleaning and repainting with inorganic zinc coating to the specified thickness.
- D. Surface hardness of inorganic zinc shall be a minimum 2H when measured in conformance with the requirements in ASTM Designation: D 3363. Each joint seal assembly, bearing and restrainer unit shall be tested for surface hardness. Inorganic zinc coating that fails to meet the surface hardness requirements shall be repaired by the Contractor, at the Contractor's expense, by blast cleaning and repainting with inorganic zinc coating to the specified thickness.

The Contractor, at the Contractor's expense, shall retest all rejected areas of inorganic zinc coating after repairs have been completed.

Full compensation for cleaning and painting of joint seal assembly shall be considered as included in the contract unit price paid for joint seal assembly (MR 100 mm) and no separate payment will be made therefor.

Full compensation for cleaning and painting of PTFE spherical bearings shall be considered as included in the contract unit price paid for PTFE spherical bearing, and no separate payment will be made therefor.

Full compensation for cleaning and painting of restrainer unit (bar type) shall be considered as included in the contract price paid per kilogram for restrainer unit (bar type) and no separate payment will be made therefor.

#### **10-1.116 ALTERNATIVE PIPE**

Alternative pipe culverts must comply with Section 62, "Alternative Culverts," of the Standard Specifications, and these special provisions.

Concrete backfill for alternative culverts shall be constructed in conformance with the provisions in Section 66-1.045, "Concrete Backfill," of the Standard Specifications and will be measured and paid for in conformance with the provisions in Section 66-4, "Measurement and Payment," of the Standard Specifications and the following:

- A. The quantity of concrete backfill to be paid for, regardless of the kind of culvert and wall thickness of the culvert installed, will be based on the dimensions shown on the plans and the installation of corrugated steel pipe, except that when reinforced concrete pipe is designated as the only kind of culvert allowed for the installation of an alternative culvert, the quantity of concrete backfill to be paid for at that installation, regardless of the kind of culvert and wall thickness of the culvert installed, will be based on the dimensions shown on the plans and the installation of reinforced concrete pipe with the least wall thickness shown in AASHTO Designation: M 170M for the Class of pipe designated.

#### **10-1.117 PLASTIC PIPE**

Plastic pipe shall conform to the provisions in Section 64, "Plastic Pipe," of the Standard Specifications and these special provisions.

Plastic pipe shall be smooth interior wall type.

#### **10-1.118 REINFORCED CONCRETE PIPE**

Reinforced concrete pipe shall conform to the provisions in Section 65, "Reinforced Concrete Pipe," of the Standard Specifications and these special provisions.

##### **GENERAL**

Where embankment will not be placed over the top of the pipe, a relative compaction of not less than 85 percent shall be required below the pipe spring line for pipe installed using Method 1 backfill in trench, as shown on Standard Plan A62D. Where the pipe is to be placed under the traveled way, a relative compaction of not less than 90 percent shall be required unless the minimum distance between the top of the pipe and the pavement surface is the greater of 1.2 meters or one half of the outside diameter of the pipe.

Except as otherwise designated by classification on the plans or in the specifications, joints for culvert and drainage pipes shall conform to the plans or specifications for standard joints.

##### **MATERIALS**

The concrete for reinforced concrete pipe must contain not less than 400 kg of cementitious material per cubic meter with a water-cementitious material ratio not to exceed 0.35 by weight. Reinforcement shall have a minimum cover of 25 mm. Supplementary cementitious material is optional.

#### **10-1.119 CORRUGATED METAL PIPE**

Corrugated metal pipe culverts shall conform to the provisions in Section 66, "Corrugated Metal Pipe," of the Standard Specifications and these special provisions.

Asphaltic mastic coating shall be placed on the outside and inside surfaces of the pipe.

Corrugated steel pipe shall be fabricated from zinc-coated steel sheet.

#### **10-1.120 COLUMN ISOLATION PIPE**

Column isolation pipe for column isolation casing and column isolation sleeve as shown on the plans shall conform to the provisions in Section 67, "Structural Metal Plate Pipe," of the Standard Specifications and these special provisions.

All metal parts in column isolation pipe including pipe struts, bolts, anchorages inside and outside the pipe shall be protected with bituminous coating conforming to the requirements in Section 66-1.03, "Protective Coatings, Linings and Pavings," of the Standard Specifications.

Asphaltic mastic coating or polymeric sheet coating substituted for bituminous coating shall be placed on the outside and inside surfaces of the pipe.

Neoprene strip shall conform to the provisions in Section 51-1.14, "Waterstops," of the Standard Specifications.

Ponding or jetting of structure backfill will not be permitted. Structure backfill (bridge) (cement modified) within 1.0 meter outside the column isolation pipe, shall be compacted to a relative compaction of not more than 90 percent.

#### **MEASUREMENT AND PAYMENT**

Column isolation pipe will be measured and paid for by the kilogram as corrugated steel pipe (isolation sleeve).

The contract price paid per kilogram for corrugated steel pipe (isolation sleeve) shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in column isolation pipe, complete in place, including supporting pipe struts and fasteners, neoprene strip, steel plates and shapes and expansion anchorage devices, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

#### **10-1.121 UNDERDRAIN**

50 mm plastic pipe, 100 mm plastic pipe, 200 mm plastic pipe, and 200 mm perforated plastic pipe underdrains shall conform to the provisions in Section 68-1, "Underdrains," of the Standard Specifications and these special provisions.

#### **10-1.122 MISCELLANEOUS FACILITIES**

Alternative flared end sections at locations, as shown on the plans, shall conform to the provisions in Section 70, "Miscellaneous Facilities," of the Standard Specifications and these special provisions.

#### **10-1.123 DRAINAGE INLET MARKER**

The Contractor shall furnish and install plastic, thermoplastic, or stamped drainage inlet markers in conformance with the details and locations shown on the plans, as specified in these special provisions, and as directed by the Engineer.

The Contractor shall furnish a Certificate of Compliance to the Engineer in conformance with the provisions in Section 6-1.07, "Certificates of Compliance," of the Standard Specifications for plastic and thermoplastic drainage inlet markers. In addition, samples of each type of drainage inlet marker shall be submitted to the Engineer 10 days before placement of the markers.

If allowed in the plans, drainage inlet markers shall be either plastic or thermoplastic at the option of the Contractor. Once a type is selected, the type of drainage inlet marker shall not be changed without written approval from the Engineer.

Plastic drainage inlet markers shall conform to ASTM Designations: G-53 and D-60 and the requirements as follow. The plastic material shall be white with ultraviolet inhibitors. When placed on the vertical face of a concrete curb, the plastic drainage inlet markers shall have a dome-shaped cover consisting of clear and non-yellowing polyurethane cover. Plastic drainage inlet markers shall be cemented to the surface of drainage inlet with adhesives as recommended by the manufacturer of the marker.

Property	Specifications	Requirements
Thickness, mm		0.65 – 1.5
Thickness (with dome), mm		1.4 – 3.0
Legend color (non-reflective)	FHWA's Color Tolerance Chart	Blue or Green (PR Color Number 3 or 4)
Background color (non-reflective)	AASHTO Designation: M249-78	White
Weathering Resistance	ASTM Designation: G-53	1500 hours without yellowing or pit

Thermoplastic drainage inlet markers shall be prefabricated, free of lead and chromium, and conform to AASHTO Designation: M249-79 and the requirements as follow. Thermoplastic drainage inlet markers shall be adhered to the surface of the drainage inlet with adhesives or heat as recommended by the manufacturer of the marker.

Property	Specifications	Requirements
Thickness, mm		2.0 – 4.0
Legend color (non-reflective)	FHWA's Color Tolerance Chart	Blue or Green (PR Color Number 3 or 4)
Background color (non-reflective)	AASHTO Designation: M249-78	White
Skid Resistance	ASTM Designation: E-303	60 BPN

The Contractor shall mechanically clean the surface before placing plastic or thermoplastic drainage inlet markers.

Drainage inlet marker will be measured as units determined from actual count in place.

The contract unit price paid for drainage inlet marker shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in furnishing and installing drainage inlet markers, complete in place, as shown on the plans, as specified in the Standard Specifications, and these special provisions, and as directed by the Engineer.

#### **10-1.124 POLYVINYL CHLORIDE SEWER PIPE**

This work shall consist of furnishing and installing polyvinyl chloride (PVC) sewer pipe including excavating, lagging, concrete pads backfilling, and other incidental work, necessary or required for a complete, satisfactory sewer installation, in accordance with the details shown on the plans and these special provisions.

Attention is directed to Section 19, "Earthwork," and Section 64, "Plastic Pipe," of the Standard Specifications.

PVC Sewer Pipe shall be circular in shape with no appreciable distortion and shall conform to ASTM D2241.

The joints for PVC Sewer pipe shall conform to ASTM D3139 for push-on-joint type pipe using flexible elastomeric seals conforming to ASTM F477. The PVC pipe bells, made as an integral part of the PVC pipe, shall conform to ASTM D3139.

**Testing.**--The Contractor shall test piping at completion of roughing in, before backfilling, and at other times as directed by the Engineer.

The system shall be tested as a single unit, or in sections as approved by the Engineer. The Contractor shall furnish necessary materials, test pumps, instruments and labor and notify the Engineer at least 3 working days in advance of testing. After testing, the Contractor shall repair all leaks and retest to determine that leaks have been stopped. Surplus water shall be disposed of after testing as directed by the Engineer.

#### **MEASUREMENT AND PAYMENT**

PVC sewer pipes will be measured in meters along center line of the pipes.

The contract price paid per meter for 150 mm PVC sewer pipe shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in installing the pipe, complete in place, including structure excavation and structure backfill and connecting new pipe to existing or new facilities, as shown on the plans, as specified in these special provisions, and as directed by the Engineer.

#### **10-1.125 SLOPE PROTECTION**

Rock slope protection shall be placed or constructed in conformance with the provisions in Section 72, "Slope Protection," of the Standard Specifications.

Rock slope protection fabric shall be woven or nonwoven type fabric, Type A or Type B, at the option of the Contractor.

#### **10-1.126 GABIONS (POLYVINYL CHLORIDE COATED)**

Gabions shall be constructed as shown on the plans and in conformance with these special provisions.

Gabions shall consist of wire mesh, cubical-celled or mattress-styled baskets that are filled on the project site with hard, durable rock. The individual wires shall have a polyvinyl chloride (PVC) coating.

Standard gabion sizes and the overall plan and profile dimensions of the gabion structures shall be as shown on the plans. Each standard gabion size shall be divided into one meter long cells by diaphragm panels. The width, height or length of the standard gabions shall not vary more than 5 percent from the dimensions specified in these special provisions or as shown on the plans.

Empty gabion baskets shall be assembled individually and joined successively. Individual gabion mesh panels (base, front, ends, back, diaphragms, and lid) and successive gabions shall be assembled so that the strength and flexibility along the joints is comparable to a single panel.



## MATERIALS

All materials for the gabions and gabion assembly shall conform to the provisions in these special provisions. Each shipment of gabion baskets to the project site shall be accompanied by a Certificate of Compliance conforming to the provisions in Section 6-1.07, "Certificates of Compliance," of the Standard Specifications.

### Mesh

At the Contractor's option, either twisted mesh or welded mesh shall be used, in conformance with Table 1 and Table 2 herein. For each standard gabion size, the same mesh style shall be used for the base, front, ends, back, diaphragms, and lid panels. Individual wires of either the twisted-mesh style or the welded-mesh style shall conform to the definitions and requirements in ASTM Designation: A 641/A 641M.

Mattress-style gabion baskets that are 0.3-m and 0.5-m high shall be manufactured from either 11-gage (3.05 mm) welded mesh or 12-gage (2.69 mm) twisted mesh. Cubical-celled gabion baskets that are one meter high by one meter wide shall be fabricated from 12-gage (2.69 mm) twisted mesh or welded mesh gages between 11-gage (3.05 mm) and 9-gage (3.76 mm), inclusive.

Table 1

CUBICAL-CELLED FACILITIES	
USA WIRE GAGE	MESH STYLE
12	Twisted Mesh
11 Min to 9 Max	Welded Mesh

Table 2

MATTRESS-STYLE FACILITIES	
USA WIRE GAGE	MESH STYLE
12	Twisted Mesh
11	Welded Mesh

GABION MESH MATERIAL PROPERTIES

Characteristic	Test Designation	Requirement
Minimum tensile strength	ASTM A370	410 MPa
Wire Size	USA Steel Wire Gage	12
Wire Diameter	ASTM A641/A641 M	2.69 mm
(Minimum)	ASTM A641/A641 M	2.59 mm
Galvanizing, Zinc	ASTM A641/A641 M, Class 3 and ASTM A90 / A90M	230 g/m <sup>2</sup>
Wire Size	USA Steel Wire Gage	11
Wire Diameter	ASTM A641/A641 M	3.05 mm
(Minimum)	ASTM A641/A641 M	2.95 mm
Galvanizing, Zinc	ASTM A641/A641 M, Class 3 and ASTM A90 / A90M	240 g/m <sup>2</sup>
Wire Size	USA Steel Wire Gage	9
Wire Diameter (Minimum)	ASTM A641/A641 M	3.76 mm
Galvanizing, Zinc	ASTM A641/A641 M	3.66 mm
	ASTM A641/A641 M, Class 3 and ASTM A90 / A90M	270 g/m <sup>2</sup>

Twisted-mesh wires shall form a uniform hexagonal pattern and shall be formed with a nonraveling twist. The area of the hexagonal opening shall not exceed the dimensions shown on the plans. Twisted-mesh gabion panels shall be manufactured from 12-gage (2.69 mm) wires with 10 gage (3.43 mm) selvage wires.

Welded-mesh wires shall form a grid pattern as shown on the plans. Welds shall be made by resistance welding. Welds and panels shall conform to the requirements in ASTM Designation: A185, except weld shears shall be 2.7 kN (minimum) for 11-gage (3.05 mm) wires and 3.6 kN (minimum) for 9-gage (3.76 mm) wires. Resistance welding after coating the wire with zinc will be acceptable if there are no large splashes, flakes or flashes of zinc at the weld.

### **Polyvinyl Chloride (PVC) Coating**

External coating shall consist of a nonconductive material, primarily polyvinyl chloride (PVC). Mesh wire, standard tie wires, standard spiral binders, internal connecting wires, preformed stiffeners, and selvage wire shall be coated with the PVC material after the zinc coating is applied in conformance with the manufacturer's specifications.

The PVC coating shall be evaluated by infrared spectral scan. The scan must closely match those of tested known acceptable products already on file at the Transportation Laboratory.

The minimum thickness of PVC which covers the wire shall be 0.38-mm, measured radially at any cross-section transverse to the wire length.

The PVC coating shall be complete by visual inspection. There shall be no nicks, cuts, holidays or abraded areas in the PVC coating of the mesh. Minor cuts, nicks, and other minor imperfections due to manufacturing, will be permitted along selvage-wrapped edges of twisted mesh. PVC will not be required to coat the ends of either style of mesh where the PVC has been trimmed along wire or panel edges during the normal manufacturing process.

PVC coating shall be resistant to degradation by ultraviolet (UV) radiation. A suitable, UV-resistant additive shall be blended with the PVC. This additive shall be identified on the Certificate of Compliance.

The color of the PVC shall be gray. The color shall be resistant to fading when exposed to natural sunlight.

### **Joints**

Standard tie wire and standard spiral binder shall conform to the definitions and requirements in ASTM Designation: A 641/A 641 M and shall conform to the following provisions:

Minimum Tensile Strength	ASTM A370	410 MPa
Tie Wire		
Wire Size (Minimum)	USA Steel Wire Gage	13.5
Wire Diameter	ASTM A641/A641 M	2.19 mm
(Minimum)	ASTM A641/A641 M	2.09 mm
Zinc Coating	ASTM A641/A641 M, Class 3 and ASTM A90 / A90M	220 g/m <sup>2</sup>
Spirals		
Wire Size (Maximum)	USA Steel Wire Gage	9
Wire Diameter	ASTM A641/A641 M	3.76 mm
(Minimum)	ASTM A641/A641 M	3.66 mm
Zinc Coating	ASTM A641/A641 M, Class 3 and ASTM A90 / A90M	270 g/m <sup>2</sup>

Spiral binders shall have a 75 mm separation between continuous, successive loops.

Alternative fasteners shall have the configurations, wire diameters, and other dimensions shown on the plans. Alternative fasteners shall conform to the definitions and requirements in ASTM Designation: A 313/A 313 M for "Stainless Steel Spring Wire" and shall be Tensile Type 302, Class 1.

### **Internal Connecting Wire**

Internal connecting wires shall be 13.5-gage (2.19 mm) minimum. Each wire shall conform to the minimum requirements for standard tie wire in these special provisions and shall be installed in conformance with the provisions in these special provisions and as shown on the plans. Alternatively, at the Contractor's option, preformed stiffeners may be substituted for internal connecting wires. Preformed stiffener wire shall meet the requirements specified for standard tie wire and shall be installed in conformance with these special provisions and the manufacturer's recommendations.

### **Geotextile Lining**

Geotextile lining shall be a durable textile that separates the sand backfill from the rock, and shall meet AASHTO M288-06 Class 3.

### **Rock**

Rock for filling gabions, which are greater than or equal to 0.5-m in height, shall vary in size and shall conform to the following:

Screen Size (mm)	Percentage Passing
305	100
102	0-5

Rock for filling gabions, which are equal to 0.3-m in height, shall vary in size and shall conform to the following:

Screen Size (mm)	Percentage Passing
203	100
102	0-5

Rock shall conform to the material provisions for rock slope protection in Section 72-2.02, "Materials," of the Standard Specifications.

The minimum unit mass of a rock-filled gabion shall be 1750 kg/m<sup>3</sup>. Verification of the 1750 kg/m<sup>3</sup> shall be performed when ordered by the Engineer. Verification shall be performed on the smallest standard gabion size to be used on the project. The rock supplied for the project shall be used for verification. Filling shall be done using the same method intended for actual construction. The mass of a rock-filled gabion shall be determined using available certified scales. The volume for calculating the unit mass shall be determined on the theoretical volume of the standard gabion which is rock-filled and weighed.

#### **GRADING, EXCAVATION AND BACKFILL**

Areas where gabions are to be placed shall be constructed to the lines and grades shown on the plans and as determined by the Engineer. Excavation or backfill for achieving the required grades shall conform to the provisions for structure excavation and backfill in Section 19, "Earthwork," of the Standard Specifications.

Attention is directed to "Geosynthetic Reinforced Embankment," of these special provisions, regarding the placement of the geosynthetic reinforced embankment, and the underdrains as shown on the plan.

#### **WALL FOUNDATION AND RETURN WALL**

Reinforced concrete footing for the gabion wall and Type 6 return wall shall conform to "Corrosion Control Concrete," "Concrete Structures," and "Reinforcement," of these special provisions.

Class 2 aggregate base shall conform to the provisions to the provisions in Section 26, "Aggregate Bases," of the Standard Specifications.

#### **ROCK SLOPE PROTECTION FABRIC PLACEMENT**

Rock slope protection fabric shall be placed in conformance with the provisions in Section 72-2.025, "Rock Slope Protection Fabric" of the Standard Specifications. Rock slope protection fabric shall be placed on the subgrade, backslope, and sides of excavations. If earth fill is to be placed over the gabions, rock slope protection fabric shall be placed on top of the gabions, before placing the earth fill.

#### **CONSTRUCTION**

Gabions shall be assembled individually as empty units. Each gabion shall be manufactured with the necessary panels, properly spaced and secured, so that the panels can be rotated into position at the construction site with no additional tying of the rotation joint. The panels and diaphragms shall be rotated into position and joined along the vertical edges.

For twisted mesh, the joint shall be constructed using alternating double and single half hitches (locked loops) of 13.5-gage (2.19 mm) standard tie wire at 100-mm nominal spacing. Joints shall not be constructed with simple spiraling (looping without locking) of the standard tie wires.

When standard tie wire is used as a joint connector for welded mesh, the joint shall be constructed using alternating double and single half hitches (locked loops) in every mesh opening along the joint. When 9-gage (3.76 mm) spiral binders are used, the spiral shall be placed so that the spiral binder passes through each mesh opening along the joint. Both ends of all 9-gage (3.76 mm) spiral binders shall be crimped to secure the spiral in place.

Temporary fasteners may be used to hold panels wherever gabion-to-gabion joints will be constructed. Temporary fasteners may remain in place.

At the Contractor's option, interlocking fasteners or overlapping fasteners may be used for assembly of either the twisted-mesh or welded-mesh gabions. A fastener shall be placed in each mesh opening along the joint (a minimum of 10 fasteners per meter).

### **ASSEMBLY OF SUCCESSIVE GABION BASKETS (GABION-TO-GABION JOINTS)**

Gabion baskets shall be set in place. Individually constructed gabion baskets shall then be joined successively to the next gabion baskets with 13.5-gage (2.19 mm) tie wire or 9-gage (3.76 mm) standard spiral binder before filling the basket with rock. The 13.5-gage (2.19 mm) standard tie wire or 9-gage (3.76 mm) standard spiral binder shall secure, in one pass, all selva or end wires of the panels of all adjacent baskets along the joint.

When forming successive gabion-to-gabion joints with alternative fasteners, there shall be one alternative fastener in each mesh opening. The alternative fastener shall contain and secure all the wires along the joint.

Gabion baskets shall be joined along the front, back, and ends, including the tops and bottoms of the adjacent gabions.

### **ASSEMBLY OF MULTIPLE LAYERED GABIONS**

Multi-layered gabion configurations shall be stepped and staggered as shown on the plans or as designated by the Engineer.

When constructing multi-layered gabion configurations, each layer of gabions shall be joined to the underlying layer along the front, back, and ends.

### **ASSEMBLY OF TRANSITIONAL GABIONS**

To match the geometry of the planned gabion configuration, or to meet specific conditions, panels shall be folded, cut and fastened as shown on the plans or as directed by the Engineer.

### **FILLING WITH ROCK**

Before filling each gabion basket with rock, all kinks and folds in the wire fabric shall be straightened and all successive gabions shall be properly aligned.

Rock shall be placed in the baskets to provide proper alignment, avoid bulges in the wire mesh, and provide a minimum of voids. All exposed rock surfaces shall have a smooth and neat appearance. Sharp rock edges shall not project through the wire mesh.

Internal connecting wires or preformed stiffeners shall be used to produce a flat, smooth external surface, when constructing with 0.5-m or one meter high gabions. If the Engineer determines that there is excessive bulging or dimpling of the outside panels, the unit shall be reconstructed at the Contractor's expense.

When filling one meter high gabions, rock shall be placed in 2 nominal 0.33-m layers to allow placement of the 13.5-gage (2.19 mm) internal connecting wires. The wires shall be fastened as shown on the plans. Alternatively, preformed stiffeners may be installed at the one-third points in conformance with the recommendations of the manufacturer, to produce a smooth external surface.

When filling 0.5-m high gabions, one nominal 0.25-m layer of rock shall be placed to allow placement of a set of internal connecting wires or preformed stiffeners. The configuration of wires shall be similar to those used on the one meter high gabions, except there shall be only one set of internal connecting wires instead of the 2 sets of internal connecting wires or preformed stiffeners.

The last layer of rock shall slightly overfill the gabion baskets so that the lid will rest on rock when the lid is closed.

### **CLOSURE OF LIDS**

Lids shall be tied along the front, ends, and diaphragms in conformance with the provisions in "Assembly of Successive Gabion Baskets (Gabion-to-Gabion Joints)" of these special provisions.

### **MEASUREMENT AND PAYMENT**

Gabions will be measured by the cubic meter as determined from the dimensions shown on the plans or the dimensions directed by the Engineer and gabions placed in excess of these dimensions will not be paid for.

The contract price paid per cubic meter for gabion shall include full compensation for furnishing all labor, materials (including gabion baskets, rock and geotextile lining), tools, equipment, and incidentals, and for doing all the work involved in constructing gabions, complete, in place, including excavation and backfill, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

### **10-1.127 MISCELLANEOUS CONCRETE CONSTRUCTION**

Concrete curb, concrete curb and gutter, concrete sidewalk, concrete curb ramps, concrete gutter, concrete gutter depression, and concrete driveway, shall conform to the provisions in Section 73, "Concrete Curbs and Sidewalks," of the Standard Specifications and these special provisions.

Curb ramp detectable warning surface shall consist of raised truncated domes constructed or installed on curb ramps in conformance with the details shown on the plans and these special provisions. At the option of the Contractor, the detectable warning surface shall be prefabricated, cast-in-place, or stamped into the surface of the curb ramp. The color of the detectable warning surface shall be yellow conforming to Federal Standard 595B, Color No. 33538.

Prefabricated detectable warning surface shall be in conformance with the requirements established by the Department of General Services, Division of State Architect and be attached in conformance with the manufacturer's recommendations.

Cast-in-place and stamped detectable warning surfaces shall be painted in conformance with the provisions in Section 59-6, "Painting Concrete," of the Standard Specifications.

The finished surfaces of the detectable warning surface shall be free from blemishes.

Prior to constructing the cast-in-place or stamping the detectable warning surface, the Contractor shall demonstrate the ability to produce a detectable warning surface conforming to the details shown on the plans and these special provisions by constructing a 600-mm by 600-mm test panel.

The manufacturer shall provide a written 5-year warranty for prefabricated detectable warning surfaces, guaranteeing replacement when there is defect in the dome shape, color fastness, sound-on-cane acoustic quality, resilience, or attachment. The warranty period shall begin upon acceptance of the contract.

Full compensation for constructing or furnishing and installing curb ramp detectable warning surfaces shall be considered as included in the contract price paid per cubic meter for minor concrete (miscellaneous construction) and no separate payment will be made therefor.

#### **10-1.128 MISCELLANEOUS METAL (BRIDGE)**

Miscellaneous metal (bridge) shall conform to the provisions for miscellaneous bridge metal in Section 75, "Miscellaneous Metal," of the Standard Specifications and these special provisions.

Miscellaneous metal (bridge) shall consist of the miscellaneous bridge metal items listed in Section 75-1.03, "Miscellaneous Bridge Metal," of the Standard Specifications, and the following:

- A. Bike path gratings and attachments
- B. Pullbox frames and covers
- C. Pedestals for future light poles.
- D. xx-strong pipe filled with concrete

Cast-in-place inserts shall be the ferrule loop type.

Metal parts of concrete anchorage devices shall be fabricated from stainless steel conforming to the requirements of ASTM Designation: A276, Type 316.

Steel shapes, plates, and other metal parts designated in the plans as stainless steel shall conform to the requirements of ASTM Designation: A276, Type 316.

Hardware for attachment of bike path gratings to stainless steel angles shall be fabricated from stainless steel conforming to the requirements of ASTM Designation: A276, Type 316.

Pullbox frames and covers shall conform to the provisions in Section 86-2.07, "Traffic Pull Boxes," of the Standard Specifications and these special provisions.

Pedestals for future light poles shall be cleaned and painted in accordance with the provisions for painting galvanized surfaces in "Clean and Paint (Miscellaneous Facilities)," of these special provisions.

Full compensation for cleaning and painting pedestals for future light poles shall be considered as included in the contract price paid per kilogram for miscellaneous metal (bridge) and no additional compensation will be allowed therefor.

Full compensation for filling xx-strong pipes with concrete as shown on the plans shall be considered as included in the contract price paid per cubic meter for structural concrete, bridge and no separate payment will be allowed therefor.

#### **10-1.129 BRIDGE DECK DRAINAGE SYSTEM**

Bridge deck drainage systems shall conform to the provisions for miscellaneous bridge metal in Section 75, "Miscellaneous Metal," of the Standard Specifications and these special provisions.

Self-tapping screws used for sleeve connections shall be hex-head stainless steel, installed in holes drilled to fit the self-tapping screws, conforming to the requirements of ASTM Designation: A 276, Type 316.

Pipe hanger assembly shall consist of steel hangers, anchor bolts, pipe clamps, nuts and bolts, and embedded steel plates. All parts shall be galvanized. The pipe hanger assembly shall be suitable for the type and size of pipe installed and shall be as shown on the plans.

Steel hangers, anchor bolts, pipe clamps, nuts and bolts, and other fittings shall be suitable for the type and size of the welded steel pipe casing and conform to the provisions in Section 75-1.03, "Miscellaneous Bridge Metal," of the Standard Specifications.

Full compensation for pipe hanger assemblies shall be considered as included in the contract price paid per kilogram for bridge deck drainage system and no additional compensation will be allowed therefor.

Couplings used to connect fiberglass pipe to steel shall be threaded or flanged.

If fiberglass pipe is substituted for welded steel pipe, the quantity of drainage piping will be computed on the basis of the dimensions and details shown on the plans, and no change in the quantities to be paid for will be made because of the use of fiberglass pipe.

Bridge deck drainage systems will be measured and paid for by the kilogram in the same manner specified for miscellaneous metal (bridge) in Section 75-1.06, "Measurement," and Section 75-1.07, "Payment," of the Standard Specifications.

#### **10-1.130 MISCELLANEOUS METAL (RESTRAINER-CABLE TYPE)**

Miscellaneous metal (restrainer-cable type) shall conform to the provisions for bridge joint restrainer units in Section 75-1.035, "Bridge Joint Restrainer Units," of the Standard Specifications and these special provisions.

New concrete adjacent to restrainers shall be placed prior to installing restrainers.

Miscellaneous metal (restrainer-cable type) will be measured and paid for by the kilogram in the same manner specified for miscellaneous metal (restrainer) in Sections 75-1.06, "Measurement," and 75-1.07, "Payment," of the Standard Specifications.

#### **10-1.131 MISCELLANEOUS METAL (RESTRAINER-BAR TYPE)**

Miscellaneous metal (restrainer-bar type) units, consisting of high strength bars, bearing plates, couplers, anchorage devices, and incidentals, shall conform to the details shown on the plans, the provisions in Section 75-1.035, "Bridge Joint Restrainer Units," of the Standard Specifications, and these special provisions.

Bar assemblies shall conform to the materials and sampling provisions for prestressing steel in Section 50, "Prestressing Concrete," of the Standard Specifications and the following:

- A. The high strength bars shall conform to the requirements of ASTM Designation: A 722, including all supplementary requirements.
- B. All new metal surfaces of bar type restrainer units shall be cleaned and painted in conformance with the provisions in "Clean and Paint Restrainer Unit (Bar Type)" of these special provisions.
- C. Anchorage devices and couplers, conforming to the requirements specified herein, shall be of a type selected by the Contractor and shall include locking devices to prevent turning or loosening.
- D. The anchorage device and coupler shall develop the specified minimum ultimate tensile strength of the steel bar.
- E. The Contractor shall be responsible for determining the required lengths of the bar assemblies.
- F. The bar assemblies shall be shipped as a complete unit including anchorage device and coupler.

Bearing plates shall conform to the requirements of ASTM Designation: A 36/A 36M.

New concrete adjacent to restrainers shall be placed prior to installing restrainers.

Elastomeric pads shall be bonded to bearing plates with adhesive conforming to the requirements in Federal Specification MMM-A-121.

Miscellaneous metal (restrainer-bar type) will be measured and paid for by the kilogram in the same manner specified for miscellaneous metal (restrainer) in Sections 75-1.06, "Measurement," and 75-1.07, "Payment," of the Standard Specifications.

Full compensation for cleaning and painting of bar type restrainer units shall be considered as included in the contract price paid per kilogram for miscellaneous metal (restrainer-bar type) and no additional compensation will be allowed therefor.

#### **10-1.132 TYPE METAL FENCE**

Type metal fence and gate shall conform to the provisions in Section 80, "Fences," of the Standard Specifications and these special provisions.

This work shall include furnishing and installing metal fence and gate at the United States Coast Guard Quarter 8 and Quarter 9 as shown on the plans.

The new Type metal fence and gate shall match the appearance of the existing metal fence and gate.

## **SUBMITTALS**

The Contractor shall submit the Manufacturer's descriptive data, material specifications and layout drawings for the Type metal fence and gate, and accessories for the Engineer's approval.

## **MATERIALS**

Type metal fence and gate shall be 2.4 meter high ornamental picket fence with curved pressed spike ends. Pickets, rails, and posts shall be manufactured from galvanized steel tubing meeting the requirements of ASTM A513 or A500 Grade B and ASTM A36. The finish for all fence and gate materials shall be hot dip galvanized in accordance with ASTM A653 with a minimum zinc coating of G90. Galvanized framework shall have an electrostatic powder coating system.

The color shall be black.

Pickets shall be square tube, 16 gauge, with outwardly curved pressed point ends. Top and bottom rails shall be steel square U channels, 14 gauge. Posts shall be a minimum of 64 millimeters square.

Maximum spacing between pickets shall be 100 millimeters. The bottom of the fence shall be a maximum of 100 millimeters from finish grade. Fence shall not contain horizontal members other than top and bottom rails.

Attaching hardware shall be stainless steel. Bolt diameters shall be a minimum of 10 millimeters. Mild steel hardware is not acceptable.

The gates shall consist of a one 1.5-m gate panel.

## **INSTALLATION**

Type metal fence including concrete anchor for the fence post and Type metal gate shall be installed in conformance with Manufacturer's specifications.

## **PAYMENT**

The contract price paid per meter for Type metal fence shall include full compensation for furnishing all labor, tools, equipment, and incidentals, and for doing all the work involved in furnishing and installing Type metal fence, complete in place, including excavating holes, backfilling, disposing of surplus excavated material, and furnishing and placing portland cement concrete footings, and connecting new fences to structures and existing cross fences, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

The contract unit price paid for Type metal gate of the type and size listed in the Engineer's Estimate shall include full compensation for furnishing all labor, tools, equipment, and incidentals, and for doing all the work involved in furnishing and installing Type metal gate, complete in place, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

### **10-1.133 CHAIN LINK FENCE (TYPE CL-1.8)**

Chain link fence and gate shall be (Type CL-1.8) at the entrance to and along utility stairs, and shall conform to the provisions in Section 80, "Fences," of the Standard Specifications and these special provisions.

The gate shall consist of two 1.2 -m gate panels.

### **10-1.134 CHAIN LINK FENCE (TYPE CL-1.2, BLACK VINYL-CLAD)**

Chain link fence shall be (Type CL-1.2, Black Vinyl-Clad) and shall conform to the provisions in Section 80, "Fences," of the Standard Specifications, and these special provisions.

The chain link fabric shall be 11-gage (3.05 mm), Type IV, Class B, bonded vinyl coated fabric, conforming to the requirements in AASHTO Designation: M 181. The color shall be black.

The strength of the bond between the coating material and steel of the bonded vinyl coated chain link fabric shall be equal to or greater than the cohesive strength of the polyvinyl chloride (PVC) coating material.

### **10-1.135 CHAIN LINK FENCE (TYPE CL-1.8, BLACK VINYL CLAD WITH EXTENSION ARM)**

Chain link fence shall be (Type CL-1.8, Black Vinyl-Clad) with barbed wire extension arms, at locations shown on the plans, and shall conform to the provisions in Section 80, "Fences," of the Standard Specifications, and these special provisions.

Barbed wire supporting arms (extension arms) shall extend upwards from the tops of the fence posts at an approximate angle of 45 degrees and shall be fitted with clips or other suitable means for attaching 3 lines of barbed wire. The top outside wire shall be attached to the extension arm at a point approximately 300 mm above the top of the chain link fabric and 300 mm out from the fence line. The other wires shall be attached to the arm uniformly between the top of the fence and the top outside wire.

Barbed wire shall conform to the provisions in Section 80-3.01C, "Barbed Wire," of the Standard Specifications. The chain link fabric shall be 11-gage (3.05 mm), Type IV, Class B, bonded vinyl coated fabric, conforming to the requirements in AASHTO Designation: M 181. The color shall be black.

The strength of the bond between the coating material and steel of the bonded vinyl coated chain link fabric shall be equal to or greater than the cohesive strength of the polyvinyl chloride (PVC) coating material.

#### **10-1.136 CHAIN LINK FENCE AND GATE (TYPE CL-1.8, BLACK VINYL-CLAD)**

Chain link fence and gate shall be (Type CL-1.8, Black Vinyl-Clad) around pad mounted transformer, and shall conform to the provisions in Section 80, "Fences," of the Standard Specifications, and these special provisions.

The gate (Type CL-1.8, Black Vinyl-Clad) shall consist of two 1.2-m gate panels

The chain link fabric shall be 11-gage (3.05 mm), Type IV, Class B, bonded vinyl coated fabric, conforming to the requirements in AASHTO Designation: M 181. The color shall be black.

The strength of the bond between the coating material and steel of the bonded vinyl coated chain link fabric shall be equal to or greater than the cohesive strength of the polyvinyl chloride (PVC) coating material.

Full compensation for furnishing and installing chain link fence and gate shall be (Type CL-1.8, Black Vinyl-Clad) around pad mounted transformer shall be considered as included in the contract lump sum price paid for YBI utility relocation of the electrical work involved and no separate payment will be made therefor.

#### **10-1.137 CHAIN LINK FENCE AND GATE (TYPE CL-3.6, BLACK VINYL CLAD)**

Chain link fence and gate shall be (Type CL-3.6, Black Vinyl-Clad), at locations shown on the plans, and shall conform to the provisions in Section 80, "Fences," of the Standard Specifications, and these special provisions.

The gate (Type CL-3.6, Black Vinyl-Clad) shall consist of two gate panels. The size of each gate panel shall be 1.2 m wide and 3.0 m high.

The chain link fabric shall be 9-gage (3.76 mm), Type IV, Class B, bonded vinyl coated fabric, conforming to the requirements in AASHTO Designation: M 181. The color shall be black.

The strength of the bond between the coating material and steel of the bonded vinyl coated chain link fabric shall be equal to or greater than the cohesive strength of the polyvinyl chloride (PVC) coating material.

#### **10-1.138 CHAIN LINK FENCE AND GATE (TYPE CL-2.4, BLACK VINYL CLAD WITH EXTENSION ARM)**

Chain link fence and gate shall be (Type CL-2.4, Black Vinyl-Clad) with barbed wire extension arms, at locations shown on the plans, and shall conform to the provisions in Section 80, "Fences," of the Standard Specifications, and these special provisions.

The 1.5-m gate (Type CL-2.4, Black Vinyl-Clad) with barbed wire extension arms shall consist of a 1.5 -m gate panel.

The 2.4-m gate (Type CL-2.4, Black Vinyl-Clad) with barbed wire extension arms shall consist of a 2.4 -m gate panel.

The 3.6-m gate (Type CL-2.4, Black Vinyl-Clad) with barbed wire extension arms shall consist of two 1.8-m gate panels.

Barbed wire supporting arms (extension arms) shall extend upwards from the tops of the fence posts at an approximate angle of 45 degrees and shall be fitted with clips or other suitable means for attaching 3 lines of barbed wire. The top outside wire shall be attached to the extension arm at a point approximately 300 mm above the top of the chain link fabric and 300 mm out from the fence line. The other wires shall be attached to the arm uniformly between the top of the fence and the top outside wire.

Barbed wire shall conform to the provisions in Section 80-3.01C, "Barbed Wire," of the Standard Specifications. The chain link fabric shall be 9 -gage (3.76 mm), Type IV, Class B, bonded vinyl coated fabric, conforming to the requirements in AASHTO Designation: M 181. The color shall be black.

The strength of the bond between the coating material and steel of the bonded vinyl coated chain link fabric shall be equal to or greater than the cohesive strength of the polyvinyl chloride (PVC) coating material.

#### **10-1.139 CANTILEVER SWING GATE (TYPE CL-2.4, BLACK VINYL-CLAD WITH EXTENSION ARM)**

Cantilever swing gate shall be (Type CL-2.4, Black Vinyl-Clad) with barbed wire extension arms including electrically controlled gate operators, vehicle detection systems, and two control boards and shall conform to the provisions in Section 80, "Fences," of the Standard Specifications and these special provisions.

Barbed wire supporting arms (extension arms) shall extend upwards from the tops of the fence posts at an approximate angle of 45 degrees and shall be fitted with clips or other suitable means for attaching 3 lines of barbed wire. The top outside wire shall be attached to the extension arm at a point approximately 300 mm above the top of



the chain link fabric and 300 mm out from the fence line. The other wires shall be attached to the arm uniformly between the top of the fence and the top outside wire.

Barbed wire shall conform to the provisions in Section 80-3.01C, "Barbed Wire," of the Standard Specifications. The chain link fabric shall be 9-gage (3.76 mm), Type IV, Class B, bonded vinyl coated fabric, conforming to the requirements in AASHTO Designation: M 181. The color shall be black.

The strength of the bond between the coating material and steel of the bonded vinyl coated chain link fabric shall be equal to or greater than the cohesive strength of the polyvinyl chloride (PVC) coating material.

### **Gate Operators and Vehicle Detection Systems**

Attention is directed to the provisions in "YBI Electrical Utility Relocations," of these special provisions for the interfaces of the cables, conduits and hardware requirements to integrate the gate installation and operation with the guard booth security system.

The electrically controlled gate operators shall be heavy duty gate operator, from one of the following manufacturers:

1. Elite Access System Inc.  
25741 Commercentre Drive, Lake Forest, CA 92630  
Telephone No.: (949) 580-1700  
Model: CSW-200-UL-1HP-PK
2. Doorking, Inc.  
120 Glasgow Ave. Inglewood, CA 90301  
Telephone No.: (800) 826-7493  
Model 6300 – 1HP motor
3. Eagle Access Control Systems, Inc  
3133 Saticoy St. North Hollywood, CA 91605  
Telephone No.: (818) 764-6690  
Model Eagle 200-DM  
or equal

The gate operators and vehicle detection systems shall be compatible and operable with the existing United States Coast Guard (USCG) security system and access control system (ACS) in the USCG Sector Command Center in Building 100.

The gates shall be operated by the card key at the entry pedestal, by a manually operated button in the USCG guard booth and by a manually operated button in the security console in the USCG Sector Command Center in Building 100. The exit gate shall be operated automatically by a vehicle loop detector and by a manual button in both the guard booth and the security console in the USCG Sector Command Center in Building 100. Each gate shall have a control that allows the gate to be locked open.

The Contractor shall furnish and install loop detector systems in the paved surfaces as shown on the plans for Entry Loop, Safety Loop, and Exit Loop functions. The Contractor shall connect the loop detector system to the electric power and the control boards.

### **Control Boards**

The Contractor shall provide two control boards in the horizontal counters in the guard booth. One control board shall operate the "In" gate, and the other the "Out" gate.

The control boards shall contain all required input and output functions to the gate operators. The control boards shall include solid state motor controls, spike suppressors, safety alarms, and all other features required for a complete gate operation system.

The control boards, that operate the gates, shall be connected and integrated into the existing United States Coast Guard (USCG) security system.

### **PAYMENT**

The contract unit price paid for cantilever swing gates (Type CL-2.4, Black Vinyl-Clad with Extension Arm) shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in furnishing and installing of the cantilevered swing and sliding gates with electrically operated gate control hardware, vehicle detector systems, control boards, and electrical connections to the guard

booth security systems, complete in place, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

#### **10-1.140 CANTILEVER SWING GATE (TYPE METAL)**

Cantilever swing gate shall be (Type Metal) including electrically controlled gate operators, and vehicle detection systems, and shall conform to the provisions in Section 80, "Fences," of the Standard Specifications and these special provisions.

Attention is directed to the provisions in "YBI Electrical Utility Relocations," of these special provisions.

The electrically controlled gate operators shall be a heavy duty gate operator from one of the following manufacturers:

1. Elite Access System Inc.  
25741 Commercentre Drive, Lake Forest, CA 92630  
Telephone No.: (949) 580-1700  
Model: CSW-200-UL-1HP-PK
2. Doorking, Inc.  
120 Glasgow Ave. Inglewood, CA 90301  
Telephone No.: (800) 826-7493  
Model 6300 – 1HP motor
3. Eagle Access Control Systems, Inc  
3133 Saticoy St. North Hollywood, CA 91605  
Telephone No.: (818) 764-6690  
Model Eagle 200-DM  
or equal

The gates shall be operated by the card key at the entry pedestal. Each gate shall have a control that allow the gate to be locked open.

The Contractor shall furnish and install loop detector systems in the paved surfaces as shown on the plans for Entry Loop, Safety Loop, and Exit Loop functions.

#### **PAYMENT**

The contract unit price paid for cantilever swing gates of the types and sizes in the Engineer's Estimate shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in furnishing and installing of the cantilevered swing and sliding gates complete with electrically operated gate control hardware, and vehicle detector systems, complete in place, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

#### **10-1.141 BIKE PATH FENCE**

Bike path fence shall be chain link fence Type CL of sizes conforming to the plans, the provisions in Section 80, "Fences," of the Standard Specifications, and "Bike Path Railing" of these special provisions.

The contract price paid per meter for bike path fence shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in constructing bike path fence, complete in place, including stainless steel bolts, washers and caps, and cleaning and painting of metal surfaces, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

#### **10-1.142 BIKE PATH RAILING**

Bike path railings shall conform to the provisions in Section 83-1.02G(2), "Metal Railing (Tubular)," of the Standard Specifications and these special provisions.

Posts shall conform to the requirements in ASTM designation: A500, Grade C.

Stainless steel plates shall conform to the requirements in designation: ASTM A167, Type 316.

Stainless steel bolts shall conform to the requirements in designation: ASTM F593, Group 2, Type 316 or 316L.

Railing grill shall conform to the provisions in Section 56-1.02F, "Steel Walkway Gratings," of the Standard Specifications. After galvanizing, the railing grill shall be free of fins, abrasions, rough or sharp edges and other surface defects and shall not be kinked, twisted or bent. If straightening is necessary, it shall be done by methods approved by the Engineer. Kinks, twists or bends in the railing grill may be cause for rejection of the railing grill.

All metal surfaces of bike path railing, including railing grill and all components, shall be hot-dip galvanized after fabrication in conformance with the provisions in Section 75-1.05, "Galvanizing," of the Standard Specifications. All exposed galvanized metal surfaces shall be cleaned and painted in conformance with the provisions for painting galvanized surfaces in "Clean and Paint (Miscellaneous Facilities)," of these special provisions.

Welding of structural steel shall conform to the requirements of AWS D1.1. Welding of structural steel to stainless steel shall conform to the requirements of AWS D1.6.

When a weld overlay is used for stainless steel surfacing, the overlay shall be placed by submerged arc welding using Type 309L electrodes. The finished overlay shall have a 2.38 mm minimum thickness after welding, grinding and polishing. Prior to welding, the manufacturer must submit a complete weld procedure to the Engineer for approval.

The Contractor shall submit working drawings in conformance to the provisions in "Working Drawings" of these special provisions.

The Contractor shall deliver completed portions of bike path railing including associated components for installation in a future contract to storage facilities within 10 miles of the Port of Oakland, Pier 7, at 345 Burma Road, Oakland, California as designated by the Engineer.

Bike path railing will be measured by the meter from end to end along the face of railing, including end and intermediate posts, and with no deductions for gaps in railing for lighting and sign supports or additions for overlaps at the expansion joints.

The contract price paid per meter for bike path railing shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in constructing bike path railing, complete in place, including stainless steel bolts, washers and caps, delivering portion of railing to be installed in a future contract to designated facilities and cleaning and painting of metal surfaces, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

#### **10-1.143 IN-GROUND TRAFFIC SPIKE**

This work shall include furnishing and installing in-ground traffic spikes in conformance with the details shown on the plans and as specified in these special provisions.

The allowable alternatives for a in-ground traffic spike shall consist of one of the following or a Department approved equal:

1. DoorKing / Quad Controls Inc. 2580 Anthem Village Drive, Henderson, NV 89052, Phone (800) 411-9226. - Model: 1610-081
2. Guardian Traffic Systems, Inc. 4261 S. Country Club, Tuscon, AZ 85714, Phone (520) 628-2613. - Model: King Cobra 1167 (Cobra II)
3. Monsoon Manufacturing L.L.C. 4275 S. Randolph Avenue, Tuscon, AZ 85714. Phone (520) 303-4444. - Model: 5500R

#### **PAYMENT**

The contract price paid per meter for in-ground traffic spikes shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in furnishing and installing of the in-ground traffic spikes, complete in place, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

#### **10-1.144 METAL BEAM GUARD RAILING**

Metal beam guard railing shall be constructed in conformance with the provisions in Section 83-1, "Railings," of the Standard Specifications and these special provisions.

Attention is directed to "Order of Work" of these special provisions.

Line posts shall be wood, steel, or plastic. Blocks shall be wood or plastic.

Metal beam guard railing elements and required backup plates, terminal sections, end caps, and return caps shall conform to the requirements of Type 2 W-Beam as shown in AASHTO Designation: M 180.

#### **ALTERNATIVE FLARED TERMINAL SYSTEM**

Alternative flared terminal system shall be furnished and installed as shown on the plans and in conformance with these special provisions.

The allowable alternatives for a flared terminal system shall consist of one of the following or a Department approved equal.

- (1) **TERMINAL SYSTEM (TYPE FLEAT)** - Terminal system (Type FLEAT) shall be a Flared Energy Absorbing Terminal 350 manufactured by Road Systems, Inc., located in Big Spring, Texas, and shall include items detailed for terminal system (Type FLEAT) shown on the plans. The Flared Energy Absorbing Terminal 350 can be obtained from the distributor, Universal Industrial Sales, P.O. Box 699, Pleasant Grove, UT 84062, Telephone (801) 785-0505 or from the distributor, Gregory Highway Products, 4100 13<sup>th</sup> Street, S.W., Canton, OH 44708, Telephone (330) 477-4800.
- (2) **TERMINAL SYSTEM (TYPE SRT)** - Terminal system (Type SRT) shall be an SRT-350 Slotted Rail Terminal (8-post system) as manufactured by Trinity Industries, Inc., and shall include items detailed for terminal system (Type SRT) shown on the plans. The SRT-350 Slotted Rail Terminal (8-post system) can be obtained from the manufacturer, Trinity Industries, Inc., P.O. Box 99, 950 West 400S, Centerville, UT 84014, Telephone (800) 772-7976.

The Contractor shall provide the Engineer with a Certificate of Compliance from the manufacturer in conformance with the provisions in Section 6-1.07, "Certificates of Compliance," of the Standard Specifications. The Certificate of Compliance shall certify that the terminal systems furnished conform to the contract plans and specifications, conform to the prequalified design and material requirements, and were manufactured in conformance with the approved quality control program.

Terminal systems shall be installed in conformance with the manufacturer's installation instructions and these requirements. Each terminal system installed shall be identified by painting the type of terminal system in neat black letters and figures 60 mm high on the backside of the rail element between system posts numbers 4 and 5.

For terminal system (Type SRT), the steel foundation tubes with soil plates attached shall be, at the Contractor's option, either driven, with or without pilot holes, or placed in drilled holes. Space around the steel foundation tubes shall be backfilled with selected earth, free of rock, placed in layers approximately 100 mm thick and each layer shall be moistened and thoroughly compacted. The wood terminal posts shall be inserted into the steel foundation tubes by hand and shall not be driven. Before the wood terminal posts are inserted, the inside surfaces of the steel foundation tubes to receive the wood posts shall be coated with a grease which will not melt or run at a temperature of 65°C or less. The edges of the wood terminal posts may be slightly rounded to facilitate insertion of the post into the steel foundation tubes.

For terminal system (Type FLEAT), the soil tubes shall be, at the Contractor's option, driven with or without pilot holes, or placed in drilled holes. Space around the steel foundation tubes shall be backfilled with selected earth, free of rock, placed in layers approximately 100 mm thick and each layer shall be moistened and thoroughly compacted. Wood posts shall be inserted into the steel foundation tubes by hand. Before the wood terminal posts are inserted, the inside surfaces of the steel foundation tubes to receive the wood posts shall be coated with a grease which will not melt or run at a temperature of 65°C or less. The edges of the wood posts may be slightly rounded to facilitate insertion of the post into the steel foundation tubes.

Surplus excavated material remaining after the terminal system has been installed shall be disposed of in a uniform manner along the adjacent roadway where designated by the Engineer.

The contract unit price paid for alternative flared terminal system shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in furnishing and installing alternative flared terminal system, complete in place, including excavation, backfill and disposal of surplus material, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

#### **10-1.145 PARKING BUMPER**

Parking bumpers shall be furnished and installed at the locations and in the manner shown on the plans.

Parking bumpers shall be precast concrete, reinforced as shown on the plans, and shall be constructed from commercial quality concrete containing not less than 280 kg {472 pounds} of cement per cubic meter {cubic yard} and reinforcing steel or shall be commercially available precast concrete bumpers conforming to the details shown on the plans. Minor variations in cross section dimensions will be acceptable in commercially available units.

Dowels shall be commercial quality reinforcing steel or mild steel rods.

Parking bumpers will be measured by the unit as determined from actual count in place.

The contract unit price paid for parking bumper (precast concrete) shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in installing precast concrete parking bumpers, complete in place, as shown on the plans, as specified in the Standard Specifications and these special provisions and as directed by the Engineer.

#### **10-1.146 MARKERS AND DELINEATORS**

Markers and delineators shall conform to the provisions in Section 82, "Markers and Delineators," of the Standard Specifications and these special provisions.

Markers and delineators on flexible posts shall conform to the provisions in "Prequalified and Tested Signing and Delineation Materials" of these special provisions. Flexible posts shall be made from a flexible white plastic which shall be resistant to impact, ultraviolet light, ozone, and hydrocarbons. Flexible posts shall resist stiffening with age and shall be free of burns, discoloration, contamination, and other objectionable marks or defects which affect appearance or serviceability.

Retroreflective sheeting for metal and flexible target plates shall be the retroreflective sheeting designated for channelizers, markers, and delineators conforming to the requirements in ASTM Designation: D 4956-95 and in conformance with the provisions in "Prequalified and Tested Signing and Delineation Materials" of these special provisions.

#### **10-1.147 BOLLARD**

##### **GENERAL**

##### **Summary**

This work includes furnishing and installing bollards as shown on the plans and as specified in the Standard Specifications and these special provisions.

##### **Submittals**

Submit a Certificate of Compliance to the Engineer under Section 6-1.07, "Certificates of Compliance," of the Standard Specifications.

##### **MATERIALS**

Bollards must be galvanized 100 mm diameter standard pipe and comply with ASTM A53, Type S, Grade B, Schedule 40, as shown on the plans.

##### **Concrete**

Concrete must be Class 3 or minor concrete and comply with the provisions in Section 90, "Portland Cement Concrete," of the Standard Specifications.

##### **Permeable Material**

Permeable material must be Class 2 and conform with the details shown on the plans, and to the provisions in Section 68-1, "Underdrains," of the Standard Specifications.

##### **CONSTRUCTION**

Install bollards in a vertical position, plumb, on true alignment and grade, and to dimensions as shown on the plans.

Loose dirt around post holes must be removed and must be tamped prior to placing posts and concrete.

Bollard must be filled with concrete and a minimum clearance of 50 mm from the top of post must be provided.

The bollards must be cut even and true and a steel cap welded to the top, as shown on the plans. Welds must be made smooth and flush. Welds must conform to the requirement in "Welding," of these special provisions.

The finish coat for bollards must conform to the provisions in "Clean and Paint Miscellaneous Facilities," of these special provisions.

The finish coat must be applied in 2 applications. The first application must consist of a spray applied mist application. The second application must be applied after the mist application has dried to a set to touch condition as determined by the procedure described in Section 7 of ASTM Designation: D 1640. The finish coat color must be equal blend of Federal Standard colors, # 27925 and #27880. The total dry film thickness of both applications of the finish coat must be not less than 125  $\mu\text{m}$ .

Surfaces to be painted must be prepared and paint applied as follows:

1. Exposed surfaces must be clean of all grease, oil, mill scale, dirt, concrete, rust, old paint or any other contaminants.
2. Prime coat must be applied at 3.0 – 4.0 mils Dry Film Thickness.
3. The top coat must be applied each at 1.5 mils Dry Film Thickness. A minimum of 24 hours must be allowed between coats for the preceding coat to dry completely.
4. Protect adjacent surfaces from exposure to or damage by overspray and airborne paint particles.

5. Do not apply paint when the air temperature in the shade is below 4.4 °C or when the surface is wet. Paint must not be applied when inclement weather conditions are forecast. The Contractor must repaint if weather affects drying.

Place retroreflective sheeting as shown on the plans. The retroreflective sheeting shall be yellow, and shall conform to the requirements in ASTM Designation: D 4956-95 and the provisions in "Prequalified and Tested Signing and Delineation Materials" of these special provisions.

## **MEASUREMENT AND PAYMENT**

Quantities of bollards to be paid for by the unit are determined from actual count in place.

The contract unit price paid for bollard includes full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in furnishing and installing bollards, complete in place, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

### **10-1.148 REMOVABLE BOLLARD**

#### **GENERAL**

##### **Summary**

This work includes furnishing and installing removable bollards as shown on the plans and as specified in the Standard Specifications and these special provisions.

##### **Submittals**

Submit a Certificate of Compliance to the Engineer under Section 6-1.07, "Certificates of Compliance," of the Standard Specifications.

#### **MATERIALS**

Removable bollards must be galvanized 100 mm diameter standard pipe and comply with ASTM A53, Type S, Grade B, Schedule 40, as shown on the plans. The inside diameter of sleeves for removable bollards must be 2.5 mm greater than the outside diameter of the post.

Removable bollards and sleeves must be fitted with a steel flange or eyebolt, welded to the bollard and sleeve, capable of accommodating a padlock as shown on the plans. Welding must comply with the requirements in "Welding," of these special provisions. Welds on exposed surfaces must be ground smooth and flush with adjacent surfaces.

Removable bollards and all metal components must be hot dipped galvanized after fabrication in accordance with ASTM A123.

##### **Concrete**

Concrete must be Class 3 or minor concrete and comply with the provisions in Section 90 "Portland Cement Concrete," of the Standard Specifications.

##### **Permeable Material**

Permeable material must be Class 2 and conform with the details shown on the plans, and to the provisions in Section 68-1, "Underdrains," of the Standard Specifications.

## **CONSTRUCTION**

Install removable bollards in a vertical position, plumb, on true alignment and grade, and to dimensions as shown on the plans.

Remove loose dirt around post holes and tamp prior to placing posts and concrete.

Place permeable material and concrete into the excavation as shown on the plans, and crown 25 mm above grade to shed water away from the post. Brace removable bollards as required, to ensure post remain vertical, plumb and in the design location.

The finish coat for removable bollards must conform to the provisions in "Clean and Paint Miscellaneous Facilities," of these special provisions.

The finish coat must be applied in 2 applications. The first application must consist of a spray applied mist application. The second application must be applied after the mist application has dried to a set to touch condition as determined by the procedure described in Section 7 of ASTM Designation: D 1640. The finish coat color must

be equal blend of Federal Standard colors # 27925 and #27880. The total dry film thickness of both applications of the finish coat must be not less than 125  $\mu\text{m}$ .

Surfaces to be painted must be prepared and paint applied as follows:

1. Exposed surfaces must be clean of all grease, oil, mill scale, dirt, concrete, rust, old paint or any other contaminants.
2. Prime coat must be applied at 3.0 – 4.0 mils Dry Film Thickness.
3. The top coat must be applied each at 1.5 mils Dry Film Thickness. A minimum of 24 hours must be allowed between coats for the preceding coat to dry completely.
4. Protect adjacent surfaces from exposure to or damage by overspray and airborne paint particles.
5. Do not apply paint when the air temperature in the shade is below 4.4 °C or when the surface is wet. Paint must not be applied when inclement weather conditions are pending. The Contractor must repaint if weather affects drying.

Place retroreflective sheeting as shown on the plans. The retroreflective sheeting shall be yellow, and shall conform to the requirements in ASTM Designation: D 4956-95 and the provisions in "Prequalified and Tested Signing and Delineation Materials" of these special provisions.

Provide padlocks for each removable guard post and at least 2 sets of keys to the Engineer.

#### **MEASUREMENT AND PAYMENT**

Quantities of removable bollard to be paid for by the unit are determined from actual count in place.

The contract unit price paid for removable bollard includes full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in furnishing and installing removable bollards, complete in place, including padlocks and keys, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

#### **10-1.149 PEDESTRIAN RAILING**

Pedestrian railing shall conform to the details shown on the plans and the provisions in Section 83-1, "Railings," of the Standard Specifications.

#### **10-1.150 CONCRETE BARRIER**

Concrete barriers shall conform to the provisions in Section 83-2, "Barriers," of the Standard Specifications and these special provisions.

Bar reinforcing steel for use in concrete barriers shall conform to the provisions in "Epoxy-Coated Prefabricated Reinforcement," of these special provisions.

Where existing reinforcement is to be incorporated into new concrete, any existing wrapping or grease shall be removed from reinforcement and existing concrete and reinforcement shall be cleaned of all loose material by abrasive blasting. Any damage to the existing epoxy-coated reinforcement shall be repaired prior to casting new concrete in conformance with the provisions in "Reinforcement" of these special provisions.

Where barrier reinforcement is required to be extended into existing structure, provide compatible mechanical couplers as shown on the plans.

Full compensation for epoxy-coated bar reinforcement shall be considered as included in the contract price paid per meter for concrete barrier of the type or types listed in the Engineer's Estimate and no separate payment will be made therefor.

Structural steel cover plates and hardware required for barrier cover plate to join concrete barrier at expansion joints and at other locations shown on the plans shall conform to the details shown on the plans and to the provisions for materials, fabrication and galvanizing in Sections 75-1.03, "Miscellaneous Bridge Metal," and 75-1.05, "Galvanizing" of the Standard Specifications.

Attention is directed to "Welding Quality Control" in "Welding," of these special provisions.

Steel cover plate for barriers shall be cleaned and painted in accordance with the provisions for painting galvanized surfaces in "Clean and Paint (Miscellaneous Facilities)," of these special provisions.

Steel cover plate for barriers used to join concrete barrier at expansion joints and at other locations shown on the plans, including hardware will be measured and paid for as concrete barrier attached thereto.

Full compensation for removing existing wrapping or grease from existing reinforcement, providing compatible mechanical couplers and repairing damage to the existing epoxy-coated reinforcement, shall be considered as included in the contract price paid per meter for concrete barrier (Type 732 Mod) and no additional compensation will be allowed therefor.

Full compensation for cleaning and painting steel cover plates for barriers shall be considered as included in the contract price paid per meter for concrete barrier involved and no additional compensation will be allowed therefor.

Type 60 barrier modification shown on the plans will be measured and paid for by the meter as concrete barrier (Type 60 modified).

Full compensation for reinforced concrete behind the steel cover plate as shown on the plans shall be considered as included in the contract price paid per meter for concrete barrier (Type 60 modified) and no separate payment will be made therefor.

#### **10-1.151 ALTERNATIVE CRASH CUSHION**

Alternative crash cushions shall be furnished and installed at the following locations as shown on the plans and in conformance with these special provisions:

##### **Location 1, at Station R50+00.658**

1. ADIEM -350  
Manufactured by Trinity Industries, Inc., P.O. Box 99, 950 West 400S, Centerville, Utah 84014, Telephone No.: (800) 772-7976
2. REACT 9SCBS (REACT 350.9 Self Contained)  
Manufactured by Energy Absorption Systems, Inc. at 35 East Wacker Drive, Suite 1100, Chicago, IL 60601, and distributed by:
  - 2.1. Northern California: Traffic Control Service, Inc., 8585 Thys Court, Sacramento, CA 95828, telephone (800) 884-8274, Fax No.: (916) 387-9734
  - 2.2. Southern California: Traffic Control Service, Inc., 1818 E. Orangethorpe, Fullerton, CA 92831-5324, Telephone No.: (800) 222-8274, Fax No.: (714) 526-9501
3. QUADGUARD (Type QS2406Y)  
Manufactured by Energy Absorption Systems, Inc. 35 East Wacker Drive Chicago, IL. 60601-2076, Telephone No.: 312 467-6750, Fax No.: 312 467-1356, and from distributors Energy Absorption Systems, Inc. P.O. Box 3333-#291 Encinitas, CA 92024 Telephone No.: (619) 438-7887, Fax No.: (619) 438-7848, or Energy Absorption Systems, Inc. Customer Service Department, One East Wacker Drive, Chicago, IL 60601-2076, Telephone No.: 1-800-255-3240, Fax No.: (312) 467-0201
4. SMART CUSHION INNOVATIONS (Type SCI-100GM)  
Manufactured by Work Area Protection Corporation, P.O. Box 4087, St. Charles, IL 60174, Telephone No.: 630-377-9100, Fax: 630-377-9270, and from the distributor, Statewide Safety & Signs, 522 Lindon Lane, Nipomo, CA 93444, Telephone No.: 805-929-5070, Fax No.: 805- 929-5786
5. UNIVERSAL TAU-II System (Type Test Level 3)  
Manufactured by Barrier System Inc., Sales and Service, 180 River Road, RioVista, CA. 94571, Telephone No.: (888) 800-3691, Fax No.: (707) 374-6801
6. TRACC (Trinity Attenuating Crash Cushion) (Test Level 3)  
Manufactured by Trinity Highway Products, LLC, 950 West 400 South, Centerville, UT 84014, Telephone No.: (800)-772-7976, Fax No.: (801)-292-2145

##### **Location 2, at Station R1 50+99.527**

1. ADIEM -350  
Manufactured by Trinity Industries, Inc., P.O. Box 99, 950 West 400S, Centerville, Utah 84014, Telephone No.: (800) 772-7976
2. QUADGUARD (Type QS2406Y)  
Manufactured by Energy Absorption Systems, Inc. 35 East Wacker Drive Chicago, IL. 60601-2076, Phone :312 467-6750, Fax No.: 312 467-1356, and from distributors Energy Absorption Systems, Inc. P.O. Box 3333-#291 Encinitas, CA 92024, Telephone No.: (619) 438-7887, Fax No.: (619) 438-7848, or Energy Absorption Systems, Inc. Customer Service Department, One East Wacker Drive, Chicago, IL 60601-2076, Telephone No.: 1-800-255-3240, Fax No.: (312) 467-0201
3. SMART CUSHION INNOVATIONS (Type SCI-70GM)  
Manufactured by Work Area Protection Corporation, P.O. Box 4087, St. Charles, IL 60174, Telephone No.: 630-377-9100, Fax No.: 630-377-9270, and from the distributor, Statewide Safety & Signs, 522 Lindon Lane, Nipomo, CA 93444, Telephone No.: 805-929-5070, Fax No.: 805- 929-5786



**Location 3, at Stations SG 11+22.859 and Location 4, at SG 11+25.205**

1. TRACC (Trinity Attenuating Crash Cushion) (Type WideTRACC-B Test Level 3)  
Manufactured by Trinity Highway Products, LLC, 950 West 400 South, Centerville, UT 84014, Telephone No.: (800)-772-7976, Fax No.: (801)-292-2145
2. QUADGUARD (Type QS9003Y)  
Manufactured by Energy Absorption Systems, Inc. 35 East Wacker Drive Chicago, IL. 60601-2076, Telephone No.: 312 467-6750, Fax: 312 467-1356, and from distributors Energy Absorption Systems, Inc. P.O. Box 3333-#291 Encinitas, CA 92024, Telephone No.: (619) 438-7887, Fax No.: (619) 438-7848, or Energy Absorption Systems, Inc. Customer Service Department, One East Wacker Drive, Chicago, IL 60601-2076, Telephone No.: 1-800-255-3240, Fax No.: (312) 467-0201
3. UNIVERSAL TAU-II System (Type Test Level 2 with wide nose)  
Manufactured by Barrier System Inc., Sales and Service, 180 River Road, RioVista, CA. 94571, Telephone No.: (888) 800-3691, Fax No.: (707) 374-6801

Alternative crash cushion shall be installed in conformance with the manufacturer's recommendations.

The Contractor shall furnish the Engineer one copy of the manufacturer's plan and parts list for each model installed.

The concrete anchor slab and backup block shall conform to the provisions in Section 51, "Concrete Structures," and Section 52, "Reinforcement," of the Standard Specifications and these special provisions.

The Contractor shall provide the Engineer with a Certificate of Compliance from the manufacturer in conformance with the provisions in Section 6-1.07, "Certificates of Compliance," of the Standard Specifications. The Certificate of Compliance shall certify that crash cushion conforms with the contract plans and specifications, and conforms to the prequalified design and material requirements.

The contract unit prices paid for alternative crash cushion shall include full compensation for furnishing all labor, materials (including anchor bolts, nuts, washers, and marker panels), tools, equipment, and incidentals, and for doing all the work involved in furnishing and installing the crash cushions, complete in place, including structure excavation, structure backfill, concrete anchor slab with bar reinforcing steel, transition plate and W-beam connector, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

**10-1.152 THERMOPLASTIC TRAFFIC STRIPE AND PAVEMENT MARKING**

Thermoplastic traffic stripes (traffic lines) and pavement markings shall be applied in conformance with the provisions in Section 84, "Traffic Stripes and Pavement Markings," of the Standard Specifications and these special provisions.

Thermoplastic material shall be free of lead and chromium, and shall conform to the requirements in State Specification PTH-02ALKYD.

Retroreflectivity of the thermoplastic traffic stripes and pavement markings shall conform to the requirements in ASTM Designation: D 6359-99. White thermoplastic traffic stripes and pavement markings shall have a minimum initial retroreflectivity of  $250 \text{ mcd} \cdot \text{m}^{-2} \cdot \text{lx}^{-1}$ . Yellow thermoplastic traffic stripes and pavement markings shall have a minimum initial retroreflectivity of  $150 \text{ mcd} \cdot \text{m}^{-2} \cdot \text{lx}^{-1}$ .

Where striping joins existing striping, as shown on the plans, the Contractor shall begin and end the transition from the existing striping pattern into or from the new striping pattern a sufficient distance to ensure continuity of the striping pattern.

Thermoplastic traffic stripes shall be applied at the minimum thickness and application rate as specified below. The minimum application rate is based on a solid stripe of 100 mm in width.

Minimum Stripe Thickness (mm)	Minimum Application Rate (kg/m)
2.0	0.4

Thermoplastic traffic stripes and pavement markings shall be free of runs, bubbles, craters, drag marks, stretch marks, and debris.

At the option of the Contractor, permanent traffic striping and pavement marking tape conforming to the provisions in "Prequalified and Tested Signing and Delineation Materials" of these special provisions may be placed

instead of the thermoplastic traffic stripes and pavement markings specified herein. Permanent tape, if used, shall be installed in conformance with the manufacturer's specifications.

If permanent tape is placed instead of thermoplastic traffic stripes and pavement markings, the tape will be measured and paid for by the meter as thermoplastic traffic stripe and by the square meter as thermoplastic pavement marking.

#### **10-1.153 PAVEMENT MARKERS**

Pavement markers shall be placed in conformance with the provisions in Section 85, "Pavement Markers," of the Standard Specifications and these special provisions.

Attention is directed to "Traffic Control System For Lane Closure" of these special provisions regarding the use of moving lane closures during placement of pavement markers with bituminous adhesive.

The Contractor shall furnish the Engineer certificates of compliance for the pavement markers in conformance with the provisions in Section 6-1.07, "Certificates of Compliance," of the Standard Specifications.

Retroreflective pavement markers shall be marked as abrasion resistant on the body of the markers.

#### **10-1.154 BENCH AND TRASH RECEPTACLE**

##### **GENERAL**

This work includes furnishing and installing benches and trash receptacles at the locations shown on the plans and as specified in the standard specification and these special provisions.

Benches and trash receptacles must be prefabricated and factory assembled by the same manufacturer and from one of the following manufacturers:

##### **1. Bench**

- 1.1. Model "Petoskey - Support Backed Bench or equal ," with a 16 mm solid metal round bar seat insert, as manufactured by Landscapeforms, 431 Lawndale Ave. Kalamazoo, MI 49048, telephone 1-(800)-521-2548.
- 1.2. Model "Genova" with a 16 mm solid metal round bar seat insert or equal , as manufactured by Thomas Steele division of Trilary, Inc, Preeminence P.O.Box 1141 Seaford, DE 19973, telephone 1-(800)-401-1388.
- 1.3. Model number 137-60,as manufactured by Dumor or equal , Ross Recreation Equipment Co 100 Brush Creek Road, Suite 206 Santa Rosa, Ca 954054, telephone (707) 538-3800.

##### **2. Trash Receptacle**

- 2.1. Model "Petoskey" - steel trash receptacle or equal, as manufactured by Landscapeforms, 431 Lawndale Ave. Kalamazoo, MI 49048, telephone 1-(800)-521-2548.
- 2.2. Model "Genova" GNTR - 32 steel trash receptacle or equal with a dome lid, as manufactured by Thomas Steele division of Trilary, Inc, Preeminence P.O.Box 1141 Seaford, DE 19973, telephone 1-(800)-401-1388.
- 2.3. Model series 158-32, as manufactured by Dumor or equal, Ross Recreation Equipment Co 100 Brush Creek Road, Suite 206 Santa Rosa, Ca 954054, telephone (707) 538-3800.

##### **Finish Coat**

The finish coat for benches and trash receptacles must conform to the provisions in "Clean and Paint Structural Steel (Miscellaneous Facilities)," of these special provisions.

The finish coat must be applied in 2 applications. The first application must consist of a spray applied mist application. The second application must be applied after the mist application has dried to a set to touch condition as determined by the procedure described in Section 7 of ASTM Designation: D 1640. The finish coat color must be equal blend of Federal Standard colors # 27925 and #27880. The total dry film thickness of both applications of the finish coat must be not less than 125 µm.

##### **Submittals**

Submit a Certificate of Compliance for benches to the Engineer under Section 6-1.07, "Certificates of Compliance," of the Standard Specifications, and a copy of the Manufacturer's warranty.

## **CONSTRUCTION**

Benches and trash receptacles must be installed and anchored to the finish grade in accordance with the manufacturer's specifications.

Clean benches promptly after installation in accordance with manufacturer's instructions. Do not use harsh cleaning materials or methods that could damage finish.

Minor damage to bench or trash receptacle during loading, shipping, and installation as determined by the Engineer must be repaired in accordance with manufacturer's specifications at the Contractor's expense, and must be approved by the Engineer.

Damage to bench or trash receptacle beyond repair as determined by the Engineer, during loading, shipping, and installation must be replaced by the Contractor at the Contractor's expense.

## **MEASUREMENT AND PAYMENT**

Quantities of bench to be paid for by the unit are determined from actual count in place.

Quantities of trash receptacle to be paid for by the unit are determined from actual count in place.

The contract unit price paid for bench includes full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in furnishing and installing benches, complete in place, including storing and transporting benches, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

The contract unit price paid for trash receptacle includes full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in furnishing and installing trash receptacles, complete in place, including storing and transporting trash receptacles, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

## **10-1.155 BASKETBALL AND VOLLEYBALL COURT**

### **GENERAL**

#### **Summary**

This work shall consist of constructing the standard outdoor basketball court and outdoor volleyball court, and furnishing and installing basketball hoop system and volleyball net system, as shown on the plans and in conformance with the provisions in the Standard Specifications and these special provisions.

### **OUTDOOR COURT**

#### **1. Structural Section**

The outdoor court for basketball and volleyball shall have the following structural section:

- 1.1. 100 mm minor concrete with cement content not less than 325 kilograms per cubic meter in conforming to "Portland Cement Concrete," of the Standard Specifications.
- 1.2. 150 mm Class 3 aggregate base in conformance with "Aggregate Base," of the special provisions.

#### **2. Cross Slope**

Cross-slope of the basketball court shall be either from end to end or side to side of the court. The cross-slope shall be 1% or 10-mm per meter to preclude standing water and ensure sufficient drainage.

#### **3. Court Surfacing**

Provide court surfacing, which consists of placing the resurfacing coat, acrylic color filler coat, and acrylic finish coat, after the outdoor court has been overlaid with PCC, and approved by the Engineer, regarding the cross slope of the of the outdoor court.

##### **3.1. Resurfacing Coat**

Resurfacing coat shall be a mixture of the following:

- 3.1.1. 120-185 kgs. of #60-80 mesh sand
- 3.1.2. 250 liters of Acrylic resurfacer
- 3.1.3. 75 to 150 liters of water

The acrylic resurfacer mixture shall be thoroughly mixed in a mortar mixer and applied to the court surface by pouring from a can or a wheeled container to continuous parallel lines and spread immediately with a 70 durometer rubber squeegee.

There shall be two applications of acrylic resurfacer. The total amount of resurfacer shall be not less than 82 liters minimum per 100 square meters. Allow the acrylic resurfacer to dry thoroughly. Scrape off all ridges and rough spots.

3.2. Acrylic Color Filler Coat

Acrylic color filler coat shall be a mixture of the following:

- 3.2.1. 115 liters of plexipave color base (color to be determined by USCG)
- 3.2.2. 38 liters of plexichrome resurfacer pigment
- 3.2.3. 60 to 70 liters of water

Materials specified for the acrylic color filler coat shall be delivered to the site in sealed, properly labeled containers and water used in mixing shall be fresh and potable. Coverage rates are based upon manufacturer's material prior to mixing with water.

Acrylic color filler coat shall be applied to court surface by pouring from a can or a wheeled container to continuous parallel lines and spread immediately with a 50 durometer rubber squeegee. Two coats shall be applied. The first coat shall applied lengthwise of the court and the second coat crosswise of the coat. Experienced, careful trained workmen shall do all work.

Each coat of acrylic color filler shall be applied at a rate not less than 25 liters of undiluted filled acrylic material per 100 square meters. The total amount of undiluted filled acrylic material shall be not less than 50 liters per 100 square meters.

3.3. Acrylic Finish Coat

Acrylic finish coat shall be an equal mixture of water and plexichrome pigment.

Acrylic color finish coat shall be applied to court surface by pouring from a can or a wheeled container to continuous parallel lines and spread immediately with 50 durometer rubber squeegee or roller followed by a wide hair-type broom.

The acrylic finish coat shall be applied at a rate of not less than 30 liters (min) of undiluted unfilled acrylic material per 100 square meters.

3.4. Acrylic Line Paint

Acrylic line paint shall be plexicolor line paint. The paint shall be a 100 percent acrylic emulsion type containing no alkyds, butadiene, or vinyl's and shall be thinned with water only.

Acrylic line paint shall be applied as shown on the plans. The playing lines shall be accurately located and marked by snapping chalked line on the court surface. Lines shall be 50 mm in width. Edges of lines shall be sharp and the lines shall be straight and even except where circular shapes are called for on the details. The color of the paint for basketball court lines shall be white and yellow for volleyball court lines.

The acrylic line paint shall be applied at a rate of not less than 3.7 (min) square meter per liter.

## **BASKETBALL HOOP SYSTEM**

Basketball hoop system shall consist of 114 mm diameter ASTM A53 Schedule 40 galvanized steel pipe post, overhang, acrylic backboard, and goal as shown on the plans.

The galvanized steel pipe post shall be installed in concrete footing as shown on the plans. Concrete for footings shall be of 25 MPa strength.

## **OUTDOOR VOLLEYBALL NET SYSTEM**

Volleyball net system shall consist of outdoor ground galvanized steel pipe sleeves with neoprene seal cap, aluminum post, net, tension and non tension slider bars, net top tension crank, height label, and volleyball standards.

Ground sleeve steel pipes shall be 95.3 mm outside diameter and 90.4 mm inside diameter . Ground sleeve steel pipes shall have an overall length of 390 mm and shall have 12.7 mm diameter limit pin. Galvanized steel volleyball post shall be constructed with an 89 mm outside diameter and net size shall be the official size of 810 mm x 990 mm.

## **PAYMENT**

The contract lump sum price paid for basketball and volleyball court includes full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in constructing the outdoor basketball and volleyball court, and furnishing and installing basketball hoop system and volleyball net

system, complete in place, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

#### **10-1.156 INSTALL FIRE HYDRANT**

The work shall consist of installing State-furnished fire hydrant. All other materials and accessories such as tee connection with the main, service pipe, bury, gate valve with box frame, cover and dust pan, restraining rings, and bell bends, as shown on the plans, and as specified in "Water Mains," of these special provisions shall be supplied and installed by the Contractor, except the riser and fire hydrant which will be installed by the San Francisco Public Utilities Commission/Water Department (SFWD).

The SFWD is the jurisdictional water utility district, regarding Navy water main.

Attention is directed to Section 7-1.14, "Cooperation," of the Standard Specifications and these special provisions.

Excavating, trenching, backfilling and testing work shall be performed by the Contractor.

The Contractor shall notify in writing the Engineer and the SFWD, at least 15 working days in advance of any work to be performed by SFWD forces, who will perform the installation of the riser and fire hydrant and disinfection. The Contractor shall confirm the scheduled work with the Engineer, and SFWD at (415) 550-4949, at least 3 working days before the actual field work by SFWD.

Hydrant bury shall be secured by installing lugs, restraining ring assembly, bell band and tie rod bolts as shown on the plans and as directed by the Engineer. Concrete thrust block, of such size as the Engineer may direct, shall be 21 MPa strength and poured against undisturbed soil in the bottom and side of the trench. The backfill around the block shall be thoroughly tamped.

Hydrant shall be set exactly plumb and at the proper elevation on a block of reinforced concrete or as directed by the Engineer. The Contractor shall backfill where underground installation is complete. Backfilling shall be in accordance with the applicable requirements of the Standard Specifications. In completing the backfill, hydrant shall be kept plumb and adequate support to prevent future movement shall be provided. Any hydrant which is out of plumb or not firmly supported shall be properly reset by the Contractor at the Contractor's expense.

#### **Testing**

The system shall be tested as a single unit, or in sections as approved by the Engineer. The Contractor shall furnish necessary materials, test pumps, instruments and labor and notify the Engineer at least 3 working days in advance of testing.

All piping shall be tested after assembly and prior to backfill, pipe wrapping, connecting fixtures, wrapping joints and covering the pipe. Systems shall show no loss in pressure or visible leaks.

The Contractor shall test water piping systems according to the following test schedule and in accordance with Section 20-5.03H, "Pressure Testing," of the Standard Specifications:

Test Schedule		
Piping System	Test Pressure	Test Media
Water	1550 kPa	Water

During testing of water systems, valves shall be closed and pipeline filled with water. Provisions shall be made for release of air.

After testing, the Contractor shall repair all leaks and retest to determine that leaks have been stopped. Surplus water shall be disposed of after testing as directed by the Engineer.

The contract unit price paid for install fire hydrant shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in installing fire hydrants, complete in place, including pickup and delivery of the State-furnished fire hydrant, cleaning and testing fire hydrant, and excavation and backfill, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

#### **10-1.157 WATER MAINS**

##### **PART 1-GENERAL**

##### **SUMMARY**

Scope.--This work shall consist of furnishing and installing the following US Navy water pipes complete with fittings, valves, accessories and incidentals necessary to complete the work for a ready to operate domestic water

distribution system, in accordance with the details shown on the plans, as specified in the Standard Specifications, and these special provisions:

1. 300-mm ductile iron pipe
2. 25-mm galvanized steel pipe

Excavating, trenching, backfilling and testing work shall be performed by the Contractor. SFWD personnel will perform disinfection.

The San Francisco Public Utilities Commission/Water Department (SFWD) is the jurisdictional water utility district, regarding Navy water main.

Attention is directed to Section 7-1.14, "Cooperation," of the Standard Specifications and these special provisions.

#### **SFWD WORK**

Installation of the water mains will require coordination with the Contractor's operations. The Contractor shall make the necessary arrangements with the SFWD, through the Engineer, and shall submit a schedule of work, verified by a representative of the utility company, to the Engineer. The schedule of work shall provide not less than the following number of working days, as defined in Section 8-1.06, "Time of Completion," of the Standard Specifications for the utility company to complete their work:

Utility (address)	Work Performed by the SFWD	Working Days
Water Main	Making a connection to an existing main	5
	Chlorination test including laboratory results	5
	Service change over services larger than 50-mm (per each service)	5
	Service change over services less than 50 mm (for up to 6 services)	1
	Excavation Safety Plans review	15

The Contractor shall notify in writing the Engineer and SFWD, at least 15 working days in advance before any work to be performed by SFWD forces for disconnecting, and connecting of the water main, and disinfection. The Contractor shall confirm the scheduled work with the Engineer, and SFWD at (415)550-4949, at least 3 working days before the actual field work by SFWD.

#### **REFERENCE STANDARDS**

The regulatory requirements which govern the work of this Section include the following governing Codes and Standards.

1. American Society for Testing and Materials (ASTM):
  - 1.1. ASTM Designation A53 Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless
  - 1.2. ASTM Designation B88 Seamless Copper Water Tube
  - 1.3. ASTM Designation D1557 Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures Using 4.54-kg Rammer and 457-mm Drop
2. American Water Works Association (AWWA):
  - 2.1. AWWA C104 Cement Mortar Lining for Ductile-Iron Pipe and Fittings for Water
  - 2.2. AWWA C105 Polyethylene Encasement for Ductile-Iron Pipe Systems
  - 2.3. AWWA C110 Ductile-Iron and Gray-Iron Fittings, 75-mm through 1200-mm, for Water and Other Liquids
  - 2.4. AWWA C151 Ductile-Iron Pipe, Centrifugally Cast, for Water or Other Liquids
  - 2.5. AWWA C153 Errata Nov 1996 Ductile-Iron Compact Fittings, 76-mm through 610-mm and 1,400-mm through 1,600-mm for Water Service
  - 2.6. AWWA C111 Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings
  - 2.7. AWWA C203 Coal-Tar Protective Coatings and Linings for Steel Water Pipelines - Enamel and Tape - Hot-Applied

- 2.8. AWWA C504 Rubber-Seated Butterfly Valves
  - 2.9. AWWA C509 Resilient-Seated Gate Valves for Water Supply Service
  - 2.10. AWWA C600 Installation of Ductile-Iron Water Mains and Their Appurtenances
  - 2.11. AWWA C800 Underground Service Line Valves and Fittings
3. American Society of Mechanical Engineers (ASME):
    - 3.1. ASME B16.26 Cast Copper Alloy Fittings for Flared Copper Tubes
    - 3.2. ASME B16.3 Malleable Iron Threaded Fittings
  4. Manufacturers Standardization Society (MSS) of the Valve and Fittings Industry:
    - 4.1. MSS SP-80 Bronze Gate, Globe, Angle and Check Valves

## **SUBMITTALS**

### **General Submittals**

General.--Submit listed submittals in accordance with the provisions of the Contract Documents.

Product Data.--Submit respective manufacturer's product data including catalog cuts, descriptive drawings, and literature, with all exceptions to the Specifications noted for each equipment item to be furnished under this Section including, but not limited to, ductile iron pipe, fittings, gaskets, valves, polyethylene encasement material and appurtenances.

Shoring Plans.- Submit Shoring Plans and calculations for excavation depths greater than 1.5 meters. Shoring plans shall be signed and stamped by a licensed Civil or Structural Engineer if plans deviate from Caltrans Standards.

### **Construction Schedule**

The Contractor shall complete the excavation of the trench and install appropriate shoring in conformance with the provisions in Section 5-1.02A, "Excavation Safety Plans," of the Standard Specifications. The Contractor shall submit to the Engineer for approval the excavation safety plans in accordance with "Working Drawings," of these special provisions.

### **Quality Assurance Submittals**

Test Reports.- Certified test reports showing compliance with specified performance characteristics and physical properties.

Manufacturer's Instructions.- Manufacturer's installation instructions.

### **Closeout Submittals**

Record Drawings.- Record actual location of distribution mains, valves, connections, and invert elevations for review.

## **DELIVERY, STORAGE & HANDLING**

Ordering.- Comply with manufacturer's ordering instructions and lead time requirements to avoid construction delays.

Storage and Protection.- Store materials protected from exposure to harmful weather conditions and at temperature and humidity conditions recommended by manufacturer.

## **SITE CONDITIONS**

Excavations in which products will be buried shall be dry.

## **PART 2. – PRODUCTS**

### **MATERIALS**

#### **Pipes**

**Pipe Sizes of 100 mm and Larger.--** Pipe ductile iron, Class 53 with Tyton bell and spigot ends conforming to ANSI/AWWA C151/A21.51, latest editions.

**Pipe Sizes of Less than 100 mm in Diameter.--** Pipe shall be galvanized steel pipe, standard weight, conforming to ASTM A53.

### **Fittings**

**Fittings for Ductile Iron Pipe.--**Ductile Iron Push-On Tyton compact fittings shall conform to the applicable requirements of ANSI/AWWA C110/A21.10, or ANSI/AWWA C153/A21.53, latest revisions, unless otherwise specified herein. Fittings shall accommodate a "Field-Lok" type gasket.

**Fittings for Galvanized Steel Pipe.--** Fittings shall be screwed fittings conforming to ASME B16.3. Flanged fittings shall conform to AWWA C207. Fittings shall be galvanized.

**Lining and Coating.--**Ductile iron pipe, and fittings shall be lined with double cement-mortar lining with an asphaltic seal coating, 0.03 mm (1 mil), in accordance with AWWA C104. The exterior of ductile iron pipe, specials, and fittings shall be coated with a 0.03-mm (1-mil) asphaltic coating in accordance with AWWA C151, Section 51-9.

**Protective Materials for Galvanized Steel Pipe.—**Protective materials for steel pipe, except as otherwise specified, shall be mechanically applied in a factory or plant especially equipped for the purpose. The materials shall, unless otherwise indicated on the plans, consist of the following: The pipe shall be thoroughly cleaned of foreign material by wire brushing and solvent cleaning, and then given 1 coat of coal-tar primer and 2 coats of coal-tar enamel conforming to AWWA C203. Threaded ends of pipe and fittings shall be adequately protected prior to coating.

### **Pipe Joints**

**Joints for Ductile Iron Pipe.--** Joints for ductile iron pipe 100 mm and larger, "Field-Lok" type of gaskets shall be used.

**Joints for Galvanized Steel Pipe.--** Joints shall be as follows:

1. Mechanical Couplings: Mechanical couplings for steel pipe shall be the sleeve type, or when approved, the split-sleeve type and shall provide a tight flexible joint under all reasonable conditions, such as pipe movements caused by expansion, contraction, slight setting or shifting in the ground, minor variations in trench gradients, and traffic vibrations. Couplings shall be of strength not less than the adjoining pipeline.
2. Bonded Joints: Bonded joints shall be used to maintain electrical continuity in metallic pipeline where cathodic protection is provided during construction or where it is anticipated that cathodic protection will be provided in the future. Where indicated, for all ferrous pipe, a metallic bond shall be provided at each joint, including joints made with flexible couplings, caulking, or rubber gaskets, of ferrous metallic piping to effect continuous conductivity. The bond wire shall be Size 1/0 copper conductor suitable for direct burial shaped to stand clear of the joint. The bond shall be of the thermal weld type.
3. Isolation Joints: Isolation joints shall be installed between nonthreaded ferrous and nonferrous metallic pipe, fittings and valves. Isolation joints shall consist of a sandwich-type flange isolation gasket of the dielectric type, isolation washers, and isolation sleeves for flange bolts. Isolation gaskets shall be full faced with outside diameter equal to the flange outside diameter. Bolt isolation sleeves shall be full length. Units shall be of a shape to prevent metal-to-metal contact of dissimilar metallic piping elements.
  - 3.1. Sleeve-type couplings shall be used for joining plain end pipe sections. The two couplings shall consist of one steel middle ring, two steel followers, two gaskets, and the necessary steel bolts and nuts to compress the gaskets.
  - 3.2. Split-sleeve type couplings may be used in aboveground installations when approved in special situations and shall consist of gaskets and a housing in two or more sections with the necessary bolts and nuts.

### **Valves**

**Valves 100 mm and Larger.--** Valves 100 mm and larger in size shall be push-on (Tyton by Tyton ends) and can accommodate "Field-Lok" gaskets, resilient seated, non-rising stem, right turn open and nut operated

**Valves Smaller than 80 mm.--** Valves smaller than 80 mm shall be all bronze and shall conform to MSS SP-80, Type 1, Class 150. Connections shall be screw-in, flared, or flanged as required.



**Polyethylene Encasement.**--Polyethylene encasement for pipe and fittings shall conform to AWWA C105. Eight (8) mil Polyethylene tubes shall be used.

#### **MISCELLANEOUS METAL**

All connecting devices, including Tie Rods, Rod Couplings, Pipe Clamps, Restraints and related hardware shall be as shown on plans.

Saddle shall feature brass body with stainless steel straps and hardware.

#### **TRENCH BEDDING AND BACKFILL**

**Sand Bed.**--All pipe shall be constructed on a prepared or natural sand bed the width of which shall be at least 300 mm plus the full width of the pipe, and not less than 100 mm thick below the pipe after installation.

**Sand Backfill.**--Backfill around all pipes from the bottom of the trench to a height 150 mm above the top of pipes for the full width of the trench shall be sand only. Sand backfill material shall be in accordance with the applicable requirements of the Standard Specifications.

**Backfill Above Required Sand.**--Backfill material above the required sand shall be in accordance with the applicable Standard Specifications.

### **PART 3. - EXECUTION**

#### **MAINTAINING WATER SERVICES**

Maintain water service and conduct operations at times selected to minimize the duration and inconvenience of service interruption.

Keep existing water mains that will be replaced by new water mains in service until new water mains are ready for service.

#### **CUTTING OF PIPE**

Cutting of pipe shall be done in a neat and workmanlike manner without damage to the pipe. Unless otherwise recommended by the manufacturer and authorized by the Engineer, cutting shall be done with an approved type mechanical cutter. Wheel cutter shall be used when practicable.

#### **PIPE INSTALLATION**

The trench shall be excavated so that a 100 mm thick layer of sand bedding can be installed beneath the pipe bottom such that the barrel of the pipe will have an even bearing along its entire length and with sufficient clearance provided for any necessary operations in connection with the laying of the pipe. Bell holes shall be excavated for each pipe bell or joint.

1. Before any pipe may be installed, the grade of the trench bottom shall be to the satisfaction of the Engineer. Immediately prior to installing the pipe, the Contractor shall remove all loose rocks and other objectionable material from the bottom of the trench and bell holes. When the trench is properly prepared, the pipe shall be lowered therein, singly, without jar or strain, and assembled by piece inside the trench.
2. Joints for ductile iron pipe shall be fastened by use of "Field-Lok" gaskets, in accordance with AWWA C600, unless otherwise directed by the Engineer.
3. The pipe shall be joined in strict adherence to the pipe manufacturer's printed installation instructions.
4. When the ductile iron pipe is cut in the field, the outside of the cut end shall be beveled about 6 mm at an angle of about 30 degrees and the leading edge rounded. The prepared cut end shall be marked at 84 mm for a 300 mm water line and 83 mm for a 200 mm water line.
5. If the joint assembly is not accomplished with the application of reasonable force, the plain end of the pipe shall be removed to check the proper position of the gasket. At the end of each day, the Contractor shall plug the end of the laid pipe.
6. Contractor shall provide locating/markings tape in the trench continuously over the centerline of the pipe per applicable requirements of these Specifications
7. The entire piping system (main and service) shall be encased with polyethylene tubes or sheets in accordance with AWWA C105. Tapes shall be used to seal the wrapping at joints and tees.

8. The Contractor shall paint all tie rods, lugs, restraining rings assembly and all miscellaneous metal attached to the pipeline installed by the Contractor with two coats of Koppers Bitumastic No. 505 or two coats of Proteco Wrap CA160 or approved equal, applied in accordance with the manufacturer's directions.
9. Insulating flanges and/or couplings shall be installed to electrically isolate the newly installed portion of pipeline from existing metallic pipelines.
10. The maximum allowable joint deflection shall be as given by the pipe manufacturer. If the alignment requires deflection in excess of the above limitations, a sufficient number of shorter lengths of pipe shall be installed to provide angular deflections within the limit set forth.
11. Valves shall be securely anchored or shall be provided with restrained joints to prevent movement. All joints on lateral and dead end of 100 mm in diameter or larger pipes shall be restrained.
12. The Contractor shall complete the excavation of the pit and install appropriate shoring to the satisfaction of the Engineer before personnel can do any work.
13. Galvanized Steel Pipe Jointing Requirements.- Screw joints shall be made tight with a stiff mixture of graphite and oil, inert filler and oil, or with an approved graphite compound, applied with a brush to the male threads only. Compounds shall not contain lead. Field joints shall be given 1 coat of coal-tar primer and 2 coats of coal-tar enamel conforming to AWWA C203. The tests of the coating shall conform to AWWA C203, and any flaws or holidays found in the coating of pipe and joints shall be repaired by patching or other approved means; the repaired areas shall be at least equal in thickness to the minimum coating required for the pipe.

#### **IDENTIFICATION OF PUSH-ON GASKET JOINTS**

The Contractor shall identify all joints with Push-On gaskets by spraying white marking paint on top of each bell and also by taping a direct burial tape around the spigot end of each pipe just in front of the bell.

#### **INSTALLING PIPE FITTINGS**

The Contractor shall include the procurement, placing, restraining, and protecting of all fittings, valves, joint restraints, and all other appurtenances to be incorporated in the work, as indicated in the Contract Documents or as directed by the Engineer.

**Installation.**-- Bends, tees, and gates of 100-mm and larger in diameter shall be fastened to the pipe or to each other by use of "Field-Lok" type gaskets. Caps shall be fastened to the pipe by use of tie rods and lugs or restrainers as shown on plans or directed by the Engineer. Additional lug and tie rod joint restraints shall be installed at locations directed by the Engineer.

**Valve Boxes.**-- Over each valve, a piece of ductile iron pipe of such size as may be required shall be placed vertically to form a valve box. A suitable cover shall be placed on top of the pipe or box. The bottom of the box shall rest on a steel plate so placed as to prevent the box from bearing on the gate. Contractor shall cut the box to such lengths that the top of the gate cover will be flush with the surface of the finished pavements shown on plans. The word "WATER" shall be cast in the cover. The box length shall adapt, without full extension, to the depth of cover required over the pipe at the valve location.

#### **INSTALLING SHORING**

The Contractor shall install an approved shoring system for all excavations 1.5 meters or more in depth, in conformance with "Excavation Safety Plans," of these special provisions.

In locations where crews will install service lines or connections to other lines, regardless of depth, the Contractor shall install a solid sheeting type shoring system, approved by the Engineer, that is capable of protecting all excavations from excessive water that may be present and give ample access to the crews to perform the installation. Shoring materials and equipment shall be removed from the excavation prior to completion of work.

#### **INSTALLATION OF SCREW TAPS**

The Contractor shall drill, tap, and install all screw taps and risers as indicated or as required by the Engineer.

Screw taps not satisfactorily installed in the opinion of the Engineer shall be removed and replaced at the expense of the Contractor. Where the screw tap installation is unsatisfactory, it shall be removed and replaced with a solid cast iron plug. The Contractor shall relocate screw taps at locations as directed by the Engineer.

#### **FIELD QUALITY REQUIREMENTS**

The Contractor shall obtain a relative compaction of not less than 95 percent throughout each layer of all backfill constructed within 1 meter of pavement subgrade, or adjacent ground. Below the top 1 meter of backfill,

the relative compaction shall not be less than 90 percent. If tests indicate work does not meet specified requirements, remove such work, replace, and retest at no additional cost to the State.

**Testing.**--The Contractor shall test piping at completion of roughing in, before backfilling, and at other times as directed by the Engineer.

The system shall be tested as a single unit, or in sections as approved by the Engineer. The Contractor shall furnish necessary materials, test pumps, instruments and labor and notify the Engineer at least 3 working days in advance of testing. After testing, the Contractor shall repair all leaks and retest to determine that leaks have been stopped. Surplus water shall be disposed of after testing as directed by the Engineer.

The Contractor shall take precautions to prevent joints from drawing while pipes and appurtenances are being tested. The Contractor shall repair damage to pipes and appurtenances or to other structures resulting from or caused by tests.

**General Tests.**--All piping shall be tested after assembly and prior to backfill, pipe wrapping, connecting fixtures, wrapping joints and covering the pipe. Systems shall show no loss in pressure or visible leaks.

The Contractor shall test water piping systems according to the following test schedule and in accordance with Section 20-5.03H, "Pressure Testing," of the Standard Specifications:

Test Schedule		
Piping System	Test Pressure	Test Media
Water	1550 kPa	Water

During testing of water systems, valves shall be closed and pipeline filled with water. Provisions shall be made for release of air.

#### **CLEANUP**

Upon completion of the installation of water lines, and appurtenances, all debris and surplus materials resulting from the work shall be removed.

#### **MEASUREMENT AND PAYMENT**

Water pipe will be measured along the centerline of the line, including fittings and valves, and paid for per meter for various sizes.

The contract price paid per meter for water pipe of various sizes and types listed in the Engineer's estimate shall include full compensation for furnishing all labor, materials, tools, equipment and incidentals, and for doing all the work involved in installing the different sizes and types of pipe, and fittings, complete in place, including structure excavation structure backfill, installing polyethylene encasement, shoring for all excavation by the Contractor for connecting and disconnecting of water mains, and testing in as shown on the plans, and as specified in these special provisions, and as directed by the Engineer.

#### **10-1.158 GAS PIPE**

##### **GENERAL**

##### **Summary**

Existing gas line (U.S. Navy) is under the jurisdiction of the City and County of San Francisco (CCSF).

This work shall consist of furnishing and installing 50-mm and 100-mm gas pipe (U.S. Navy) complete with fittings, joinings, accessories and incidentals necessary to complete the work. in compliance with the requirement of Codes and Standards, and applicable provisions and requirement of the latest revisions of the U.S. Department of Transportation (DOT) Pipeline Safety Regulations CFR 49, Part 192, "Federal Minimum Safety Standards: Transportation of Natural and Other Gases by Pipeline," and conform to these special provisions.

100-mm gas pipe (U.S. Navy) shall be connected to the existing empty 100-mm pipe, which has been installed by others.

##### **CODES AND STANDARDS**

All work performed and material installed or furnished shall conform to the applicable portions of the California Plumbing Code (CPC), the International Association of Plumbing and Mechanical Officials (IAPMO).

## **MATERIALS**

Gas pipe and fittings shall be polyethylene natural gas pipe, Class 315, conforming to ASTM Designation: D 2513.

Pipe and fittings shall be extruded or molded from polyethylene resin which conforms to ASTM Designation: D 1248, Type II, Class B with antioxidants Category 5, Grade P23. Pipe shall be marked in accordance with ASTM Designation D2513. Fittings shall conform to ASTM Designation: D 3261.

## **INSTALLATION**

Polyethylene natural gas pipe shall be installed in accordance with International Association of Plumbing and Mechanical Officials (IAPMO) Standard: IS12-2006. The depth shall be not be less than 1.1 meters.

Prior to backfilling of the polyethylene natural gas pipe, the Contractor shall furnish and install a continuous yellow warning tape, not less than 100 mm wide, with black lettering "CAUTION-BURIED GAS LINE".

The warning tape shall be installed directly above the buried gas pipes at the depth of 150 mm to 300 mm below the finished grade.

The tracer wire shall be installed with buried pipes.

## **EXCAVATION, BACKFILL AND SAND BEDDING**

Structure excavation and backfill, and sand bedding for the installation of the gas pipes shall conform to the provisions in Section 19.3, "Structure Excavation and Backfill," of these Standard Specifications.

## **MAINTAINING GAS SERVICES**

The Contractor shall give the Engineer 48-hour advance notice prior to any interruption of the gas services. Any interruption to the gas services shall not exceed 8 hours. The City and County of San Francisco shall be given 48-hour notice in advance of any interruption to the system. The City and County of San Francisco can perform any necessary isolations, or in the case of poly-pipe, the Contractor shall clamp. The Contractor shall make all necessary connections to complete the work.

## **Testing**

All piping shall be tested in the presence of the Engineer after assembly and prior to backfill, pipe wrapping, connecting fixtures, wrapping joints and covering the pipe. Systems shall show no loss in pressure or visible leaks. All piping shall be considered defective if it does not pass tests and inspections. The Contractor shall prepare and submit test and inspection reports.

The Contractor shall test gas supply system by air pressure testing to 345 kPa for a period of not less than 4 hours.

## **MEASUREMENT**

The length of pipe to be paid for will be the slope length designated by the Engineer. No payment will be made for pipe placed in excess of the length designated.

## **PAYMENT**

The contract price paid per meter for gas pipe of the size or sizes shown in the Engineer's Estimate shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in installing the gas pipe, complete in place, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

Full compensation for structure excavation, structure backfill, sand bedding, and disposal of material resulting from the excavation for gas pipe installations, shall be considered as included in the contract price paid per meter for the various sizes of gas pipe involved and no separate payment will be made therefor.

Full compensation for providing and installing the yellow (with black lettering) warning tape "CAUTION-BURIED GAS LINE" shall be considered as included in the contract paid for the various contract items of work and no additional compensation will be allowed therefor.

## **SECTION 10-2. (BLANK)**

## **SECTION 10-3. SIGNALS, LIGHTING AND ELECTRICAL SYSTEMS**

### **10-3.01 DESCRIPTION**

The following work shall conform to the details shown on the plans and the provisions in Section 86, "Signals, Lighting and Electrical Systems," of the Standard Specifications and these special provisions.

1. Underground is shown on the plans, and shall include installing copper grounding system.
2. YBI Transition Structures Roadway Westbound is shown on the plans, and shall include the following:
  - 2.1. Install 7 meter State-furnished light poles and fixtures on Bridge (WB-80).
  - 2.2. Install all conduit, pull and junction boxes, bare copper bonding, anchors, fittings and supports.
  - 2.3. Install and terminate cable itemized under "Cost Break-down" elsewhere in these special provisions.
  - 2.4. Install and terminate cables as shown on the plans and conduit and tray schedule.
  - 2.5. Conduct functional testing on all circuits, lighting, and receptacles.
3. YBI Transition Structures Roadway and Girder Eastbound is shown on the plans, and shall include the following:
  - 3.1. Install 7 meter State-furnished light poles and fixtures at on-ramp (Bridge).
  - 3.2. Install State-furnished bike path landing light poles and fixtures.
  - 3.3. Install State-furnished 3.5 meter bike path Belvedere light poles and fixtures.
  - 3.4. Install all conduit, conduits between panels and wire ways, pull and junction boxes, wire ways, bare copper bonding, anchors, fittings and supports.
  - 3.5. Install and terminate cable itemized under "Cost Break-down" elsewhere in these special provisions.
  - 3.6. Install and terminate cables as shown on the plans and conduit and tray schedule.
  - 3.7. Conduct functional testing on all lighting and receptacle circuits.
  - 3.8. Install conduits and wiring for bike path lighting.
  - 3.9. Wire bike path lighting.
  - 3.10. Install conduits and wiring for 3.5 meter bike path Belvedere light poles near Bent W2 that are furnished by others.
  - 3.11. Install conduits and wiring for call boxes.
  - 3.12. Install conduits, pull boxes, and supports for light pipe.
  - 3.13. Install conduits, pull boxes, and supports for Traffic Operation System.
  - 3.14. Install soffit light fixtures show in the YBI Electrical Utility Relocations plans.
4. Call Box System is shown on the plans, and shall include the following:
  - 4.1. Install and terminate cable itemized in "Cost Break-down" of these special provisions.
  - 4.2. Install and terminate cables and conduit and tray schedule.
  - 4.3. Conduct functional testing on all installed circuits.
5. Traffic Operation System is shown on the plans, and shall include the following:
  - 5.1. Install and test advance warning sign including all associated cables.
  - 5.2. Install and test ramp meter signal.
  - 5.3. Install and test preformed loop detector stations including associated cable and junction boxes.
  - 5.4. Install and test all fiber optic splice cabinets, fiber optic outside plant cables, splice closures, fiber optic data modems and fiber optic transceivers.
  - 5.5. Install and test State-furnished Model 170 controller cabinet assembly.
6. Removal and Salvage Electrical Devices shall include the following:
  - 6.1. Remove and salvage electrical devices, between Bent 38 and Pier E-1 of the Temporary Bypass Structure (Br. No. 34-0006 (Temp)).
  - 6.2. Remove and salvage electrical devices between Pier E-1 and Pier E-4 of the SFOBB East Bay (Br. No. 33-0025) removal (portion).
  - 6.3. Remove and dispose of all remaining electrical items per environmental regulations and Caltrans directions.

7. YBI Electrical Utility Relocations are shown on the plans and shall include the following:

- 7.1. Install 2.4 kV, 4.16 kV and 12.47 kV underground lines.
- 7.2. Abandon or remove existing 15 kV underground lines.
- 7.3. Remove or reuse existing electrical manholes.
- 7.4. Install oil filled pad mount transformer.
- 7.5. Install three phase service equipment enclosure.
- 7.6. Install cables.
- 7.7. Install equipment grounding system.
- 7.8. Install street lighting and parking lot lighting.
- 7.9. Install new basketball court lighting and controls.
- 7.10. Install new lighting at stairs.
- 7.11. Install surface mounted 120/208 V panel board.
- 7.12. Install Quarters 8 parking canopy lighting.
- 7.13. Install site security equipment.
- 7.14. Remove existing transformer and service equipment.
- 7.15. Install subsurface sectionalizing switch.
- 7.16. Install single phase service equipment enclosures.
- 7.17. Install 7 meter State-furnished light poles and fixtures at grade (Eastbound off-ramp) and at retaining wall No. 51 along Southgate Road).
- 7.18. Ground retractable (active) vehicle barrier system
- 7.19. Access control system.
- 7.20. Circuit breaker Type B.

#### 10-3.02 ABBREVIATIONS

The following abbreviations are added to those listed in Section 1-3.01, "Abbreviations," of the Standard Specifications:

AC	Alternating Current
BNC	Bayonet Nut Connector
BIL	Basic Insulation Level
CPU	Central Processing Unit
DLCI	Data Link Control Identifier
DMA	Direct Memory Access
EEMAC	Electrical Equipment Manufacturers Advisory Council
EEPROM	Electrically Erasable Programmable Read-Only Memory
EMI/RFI	Electromagnetic Interference/Radio Frequency Interference
EPR	Ethylene propylene rubber
ESO	Electrical Safety Orders of the Division of Industrial Relations, State of California
FCC	Federal Communications Commission
GFCI	Ground Fault Current Interrupter
THD	Total Harmonic Distortion
IDC	Insulation Displacement Connector
ICEA	Insulated Cable Engineering Association
IEC	International Electrotechnical Commission
I/O	Input / Output
ISDN	Integrated Services Digital Network
ISO	International Organization for Standardization
IS/OS	Individual Shield/Overall Shield
JEDEC	Joint Electron Device Engineering Council
NEC	National Electrical Code
NO	Normally Open
NC	Normally Closed
NFPA	National Fire Protection Association
NTSC	National Television Systems Committee
OSHA	Occupational Safety and Health Administration
OSI	Open Systems Interconnect

PVC	Polyvinyl Chloride
RUS	Rural Utilities Service
RGS	Rigid Galvanized Steel
RTD	Resistance Temperature Detector
SAS	Self-Anchored Suspension
SCADA	Supervisory Control And Data Acquisition
SCSI	Small Computer Systems Interface
SDLC	Synchronous Data Link Control
TELCO	Telephone company
TIA	Telecommunications Industry Association
XLPE	Cross Linked Polyethylene
YBI	Yerba Buena Island

### 10-3.03 COST BREAK-DOWN

Cost break-downs shall conform to the provisions in Section 86-1.03, "Cost Break-Down," of the Standard Specifications and these special provisions.

The Engineer shall be furnished a cost break-down for each contract lump sum item of work described in this Section 10-3.

The cost break-down shall be submitted to the Engineer for approval within 15 days after the contract has been approved. The cost break-down shall be approved, in writing, by the Engineer before any partial payment for the items of electrical work will be made.

The cost break-down shall be divided into the following categories. Within each category, each item of work shall be broken down, as a minimum, to include the following listed items in addition to those listed in the Standard Specifications:

1. Underground electrical installation is shown on the plans and shall include exothermic ground connections (list each size and type) in the cost break-down.
2. YBI Transition Structures Roadway Westbound electrical installation is shown on the plans and shall include the following additional items of the cost break-down:
  - 2.1. Cable – list each size and type.
  - 2.2. Termination and splice - list each size and type.
  - 2.3. Conduits, conduit anchors, fittings and supports – list each size and type.
  - 2.4. Pull boxes and junction boxes – list each size and type.
  - 2.5. Lifting devices – list size and type.
  - 2.6. Receptacles – list size and type.
  - 2.7. Electrical hardware – list size and type.
  - 2.8. Grounding system – list size and type.
3. YBI Transition Structures Roadway and Girder Eastbound electrical installation is shown on the plans and shall include the following additional items of the cost break-down:
  - 3.1. Cable – list each size and type.
  - 3.2. Termination and splice - list each size and type.
  - 3.3. Conduits, conduit anchors, fittings and supports – list each size and type.
  - 3.4. Pull boxes and junction boxes – list each size and type.
  - 3.5. Lifting devices – list size and type.
  - 3.6. Receptacles – list size and type.
  - 3.7. Electrical hardware – list size and type.
  - 3.8. Grounding system – list size and type
  - 3.9. Soffit lighting (shown on YBI Electrical Utility Relocations plans) – list size and type.
4. Call Box System installation details are shown on plans and shall include the following additional items of the cost break-down:
  - 4.1. Cable – list each size and type.

- 4.2. Termination and splice - list each size and type.
5. Traffic Operations System is shown on the plans with the additional items to include:
  - 5.1. Cable – list each size and type.
  - 5.2. Mounting brackets – list size and type.
  - 5.3. Fiber distribution units – list size and type.
  - 5.4. Fiber splice equipment– list size and type.
6. Removal and Salvage Electrical Devices are shown on the plans and shall include the following:
  - 6.1. Remove and salvage electrical devices, between Bent 38 and Pier E-1 of the Temporary Bypass Structure (Br. No. 34-0006 (Temp)).
  - 6.2. Remove and salvage electrical devices, between Pier E-1 and Pier E-4 of the SFOBB East Bay (Br. No. 33-0025) removal (portion).
  - 6.3. Lifting devices – list size and type.
  - 6.4. Disposal of electrical devices per environmental regulations and Caltrans direction.
7. YBI Electrical Utility Relocations is shown on the plans and shall included the following:
  - 7.1. Cable – list each size and type.
  - 7.2. Termination and splice - list each size and type.
  - 7.3. Conduits, conduit anchors, fittings and supports – list each size and type.
  - 7.4. Electrical hardware – list size and type.
  - 7.5. Equipment grounding system – list each size and type.
  - 7.6. Pull boxes and junction boxes – list each size and type.
  - 7.7. Light poles - list each size and type.
  - 7.8. Light fixtures - list each size and type.
  - 7.9. Grounding system – list size and type
  - 7.10. Poles foundations.
  - 7.12. Transformers - each type.
  - 7.13. Subsurface sectionalizing switch.
  - 7.14. Overhead cables - list each size and type.
  - 7.15. Removal of existing underground lines.
  - 7.16. Panelboards and distribution equipment.
  - 7.17. Site security equipment.
  - 7.18. Ground retractable (active) vehicle barrier
  - 7.19. Access control system
  - 7.20. Circuit breaker, Type B

#### **10-3.04 MAINTAINING EXISTING AND TEMPORARY ELECTRICAL SYSTEMS**

Relocation of the United States Coast Guard (USCG) electrical utilities at the Yerba Buena Island shall conform to the provisions in Section 86-1.06, "Maintaining Existing and Temporary Electrical Systems," of the Standard Specifications, and these special provisions.

Hetch-Hetchy Water and Power (HHWP) has the jurisdictions over the USCG electrical system.

The Contractor shall notify the USCG of any work with potential impact to utilities serving USCG facilities on YBI. Any scheduled interruptions of utility service to USCG facilities on YBI shall be coordinated and acceptable to the USCG principle representative and appropriate parties at least 7 working days in advance of the interruption. Any unintended interruptions of USCG utility by project activities shall be dealt with in an immediate response and efficient manner. The Contractor shall be prepared to provide back up or emergency utility service during any utility interruptions to the USCG facilities as determined necessary by the USCG principle representative.

The Contractor shall notify the Engineer, and HHWP, at least 21 working days in advance prior to performing any work on existing systems as shown on the plans. The Contractor shall confirm the scheduled work with the Engineer, and HHWP at (415) 274-0265, at least 7 working days before the actual field work by HHWP, regarding the following work to be performed by HHWP forces:

1. Final termination of medium voltage cable to HHWP substation
2. Final connection of heater circuits to HHWP substation equipment
3. Inspection for the relocation of the USCG electrical utilities prior to acceptance of the work



Full compensation for coordination with HHWP shall be considered as included in the contract lump sum price paid for YBI electrical utility relocations and no separate payment will be made therefor.

Full compensation for temporary facilities shall be considered as included in the contract lump sum price paid for YBI electrical utility relocations and no separate payment will be made therefor.

#### **10-3.05 MAINTAINING EXISTING TRAFFIC MANAGEMENT SYSTEM ELEMENTS DURING CONSTRUCTION**

Traffic Management System (TMS) elements include, but are not limited to ramp metering (RM) system, communication system, traffic monitoring stations, video image vehicle detection system (VIVDS), microwave vehicle detection system (MVDS), loop detection system, changeable message sign (CMS) system, extinguishable message sign (EMS) system, highway advisory radio (HAR) system, closed circuit television (CCTV) camera system, roadway weather information system (RWIS), visibility sensor, and fiber optic system.

Existing TMS elements, including detection systems, identified on the plans and located within the project limits shall remain in place, and be protected from damage. If the construction activities require existing TMS elements to be nonoperational or off line, and if temporary or portable TMS elements are not shown on the plans, the Contractor shall provide for temporary or portable TMS elements. The Contractor shall receive the Engineer's approval on the type of temporary or portable TMS elements and installation method.

Before work is performed, the Engineer, the Contractor, and the Department's Traffic Operations Electrical representatives shall jointly conduct a pre-construction operational status check of all existing TMS elements and each element's communication status with the Traffic Management Center (TMC), including existing TMS elements that are not shown on the plans and elements that may not be impacted by the Contractor's activities. The Department's Traffic Operations Electrical representatives will certify the TMS elements' location and status, and provide a copy of the certified list of the existing TMS elements within the project limits to the Contractor. The status list will include the operational, defined as having full functionality, and the nonoperational components.

The Contractor shall obtain written approval from the Engineer, at least 72 hours before interrupting existing TMS elements' communication with the TMC that will result in the elements being nonoperational or off line. The Contractor shall notify the Engineer at least 72 hours before starting excavation activities.

Traffic monitoring stations and their associated communication systems which were verified to be operational during the pre-construction operational status check, shall remain operational on freeway/highway mainline at all times, except:

1. for a duration of up to 15 days on any continuous segment of the freeway/highway longer than 4.8 kilometers
2. for a duration of up to 60 days on any continuous segment of the freeway/highway shorter than 4.8 kilometers

If the construction activities require existing detection systems to be nonoperational or off line for a longer time period or the spacing between traffic monitoring stations is more than the specified criteria above, and temporary or portable detection operations are not shown on the plans, the Contractor shall provide provisions for temporary or portable detection operations. The Contractor shall receive the Engineer's approval on the type of detection and installation before installing the temporary or portable detection.

If existing TMS elements shown on the plans or identified during the pre-construction operational status check, except traffic monitoring stations, are damaged or fail due to the Contractor's activity, where the elements are not fully functional, the Engineer shall be notified immediately. If the Contractor is notified by the Engineer that existing TMS elements have been damaged, have failed or are not fully functional due to the Contractor's activity, the damaged or failed TMS elements, excluding Structure-related elements, shall be repaired or replaced, at the Contractor's expense, within 24 hours. For a Structure-related elements, the Contractor shall install temporary or portable TMS elements within 24 hours. For nonstructure-related TMS elements, the Engineer may approve temporary or portable TMS elements for use during the construction activities.

If fiber optic cables are damaged due to the Contractor's activities, the Contractor shall install new fiber optic cables from an original splice point or termination to an original splice point or termination, unless otherwise authorized in writing by the Engineer. Fiber optic cable shall be spliced at the splice vaults if available. The amount of new fiber optic cable slack in splice vaults and the number of new fiber optic cable splices shall be equivalent to the amount of slack and number of splices existing before the damage or as directed by the Engineer. Fusion splicing will be required.

The Contractor shall demonstrate that repaired or replaced elements operate in a manner equal to or better than the replaced equipment or as directed by the Engineer. If the Contractor fails to perform required repairs or

replacement work, as determined by the Engineer, the State may perform the repair or replacement work and the cost will be deducted from monies due to the Contractor.

A TMS element shall be considered nonoperational or off line for the duration of time that active communications with the TMC is disrupted, resulting in messages and commands not transmitted from or to the TMS element.

The Contractor shall provide provisions for replacing existing TMS elements within the project limits, including detection systems, that were not identified on the plans or during the pre-construction operational status check that became damaged due to Contractor's activities.

If the pre-construction operational status check identified existing TMS elements, then the Contractor, the Engineer, and the Department's Traffic Operations Electrical representatives shall jointly conduct a post construction operational status check of all existing TMS elements and each element's communication status with the TMC. The Department's Traffic Operations Electrical representatives will certify the TMS elements' status and provide a copy of the certified list of the existing TMS elements within the project limits to the Contractor. The status list will include the operational, defined as having full functionality, and the nonoperational components. TMS elements that cease to be functional between pre and post construction status checks shall be repaired at the Contractor's expense and as directed by the Engineer.

The Engineer will approve, in writing, the schedule for final replacement, the replacement methods and the replacement elements, including element types and installation methods before repair or replacement work is performed. The final TMS elements shall be new and of equal or better quality than the existing TMS elements.

## **PAYMENT**

The contract lump sum price paid for maintaining existing traffic management system elements during construction shall include full compensation for furnishing all labor, materials, tools, equipment and incidentals, and for doing all the work involved in maintaining existing traffic management system elements as shown on the plans, specified in the Standard specifications and these special provisions, and as directed by the Engineer.

If no electrical work exists on the project and no TMS elements are identified within the project limits, the pre-construction operational status check will be paid for as extra work as provided in Section 4-1.03D, "Extra Work," of the Standard Specifications.

Furnishing and installing temporary or portable TMS elements that are not shown on the plans, but are required when an existing TMS element becomes nonoperational or off line due to construction activities, will be paid for as extra work as provided in Section 4-1.03D, "Extra Work," of the Standard Specifications.

Furnishing and installing temporary or portable TMS elements and replacing TMS elements that are not shown on the plans nor identified during the pre-construction operational status check and were damaged by construction activities will be paid for as extra work as provided in Section 4-1.03D, "Extra Work," of the Standard Specifications.

If the Contractor is required to submit provisions for the replacement of TMS elements that were not identified, the provisions will be paid for as extra work as provided in Section 4-1.03D, "Extra Work," of the Standard Specifications.

## **10-3.06 CAST-IN-DRILLED-HOLE CONCRETE PILE FOUNDATIONS (AT GRADE)**

### **GENERAL**

#### **Summary**

This work includes constructing cast-in-drilled-hole concrete pile foundations for State-furnished light poles and fixtures (at grade) in conformance with the details and locations as shown on the plans, and as specified in these special provisions.

Comply with Section 86-2.03, "Foundations," of the Standard Specifications, and "Piling," of these special provisions.

### **MATERIALS**

Concrete must contain not less than 400 kilograms of cementitious material per cubic meter, or as specified in "Piling," and "Corrosion Control For Portland Cement Concrete," of these special provisions, whichever is greater.

Bar reinforcement must be epoxy coated in conforming to the requirement in Section "Epoxy-Coated Prefabricated Reinforcement," of "Reinforcement," of these special provisions.

Anchor bolts not designated on the plans as high strength (HS) or stainless steel must conform to the requirements in ASTM Designation: F 1554, Grade 36. High strength anchor bolts shall conform to the requirements in ASTM Designation: F 1554, Grade 105.

Anchor bolts must be placed in proper position and to proper height and alignment, and shall be held in place by means of a template. The Contractor must use the anchor bolt template provided by the Engineer.

One double heavy hex nut, one leveling nut, and 2 washers must be provided for the upper threaded portion of each anchor bolt.

### **CONSTRUCTION**

For standards located in sidewalk areas, the pile foundation must be:

1. Placed to final sidewalk grade before the sidewalk is placed
2. Square for the top 100 mm

### **PAYMENT**

Payment for cast-in-drilled-hole concrete pile foundations shall conform to the provisions in Section 86-8, "Payment," of the Standard Specifications and these special provisions.

Full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in constructing the cast-in-drilled-hole pile foundations for the light poles assemblies, including drilling holes, disposing of the material resulting from drilling holes, temporarily casing holes and removing water when necessary, placing anchor bolt assemblies, furnishing and placing concrete and reinforcement, furnishing slurry, depositing concrete under slurry, test batches, inspection pipes, filling inspection holes and pipes with grout, drilling oversized cast-in-drilled-hole concrete piling, filling cave-ins and oversized piles with concrete, and redrilling through concrete, is included in the contract lump sum price paid for YBI electrical utility relocations, and no additional compensation will be allowed therefor.

## **10-3.07 CAST-IN-DRILLED-HOLE CONCRETE PILE FOUNDATIONS (UNITED STATES COAST GUARD)**

### **GENERAL**

#### **Summary**

This work includes constructing cast-in-drilled-hole concrete pile foundations for lighting at United States Coast Guard (USCG) facilities in conformance with the details and locations as shown on the plans, and as specified in these special provisions.

Comply with Section 86-2.03, "Foundations," of the Standard Specifications.

### **MATERIALS**

Concrete must contain not less than 350 kilograms of cementitious material per cubic meter.

### **CONSTRUCTION**

For standards located in sidewalk areas, the pile foundation must be:

1. Placed to final sidewalk grade before the sidewalk is placed
2. Square for the top 100 mm

Use sleeve nuts on Type 1-B standards. The bottom of the base plate of Type 1-B standards must be flush with finished grade.

### **PAYMENT**

Payment for cast-in-drilled-hole concrete pile foundations shall conform to the provisions in Section 86-8, "Payment," of the Standard Specifications.

## **10-3.08 CONSTRUCTION RESPONSIBILITY**

The Contractor shall provide all materials required for splicing and termination of cables.

All power, control and communication splices and terminations shall be by the Contractor. The Contractor shall provide the splice kits and terminate all connections.

The Contractor shall perform the final acceptance tests of each termination and splice as shown on the plans in accordance with latest applicable ICEA, International Electrical Testing Association Inc. (NETA) and IEEE standards. The tests will include continuity, backscattering, attenuation and loss measurements of fiber-optic cables, including DC High Potential Tests, continuity and megger tests, as applicable, for each splice performed.

### 10-3.09 CONDUIT

Conduit to be installed underground shall be Type 1 unless otherwise specified.

All conduit installed on the bridge shall be Type 2 unless otherwise specified. Conduit within the box girders and detector termination conduit shall be Type 1. All conduit installed in the barrier strip that are embedded into concrete shall be Type 1 or Type 2. Any conduit in the barrier strip that is not fully embedded in concrete or located exposed shall be Type 2.

The conduit in a foundation and between a foundation and the nearest pull box shall be Type 1.

Conduit sizes shown on the plans and specified in the Standard Specifications and these special provisions are referenced to metallic type conduit. When rigid non-metallic conduit is required or allowed, the nominal equivalent industry size shall be used as shown in the following table:

Size Designation for Metallic Type Conduit	Equivalent Size for Rigid Non-metallic Conduit
21	20
27	25
41	40
53	50
63	65
78	75
103	100

When a standard coupling cannot be used for joining Type 1 conduit, a UL listed threaded union coupling conforming to the provisions in Section 86-2.05C, "Installation," of the Standard Specifications, or a concrete-tight split coupling, or concrete-tight set screw coupling shall be used.

Pull ropes for use when installing cables in conduit shall consist of flat, woven, lubricated, soft-fiber polyester tape with a minimum tensile strength of 8000 N and shall have printed sequential measurement markings at least every meter.

When Type 3 conduit is placed in a trench (not in pavement or under portland cement concrete sidewalk), after the bedding material is placed and the conduit is installed, the trench shall be backfilled to not less than 100 mm above the conduit with minor concrete conforming to the provisions in Section 90-10, "Minor Concrete," of the Standard Specifications. The concrete shall contain not less than 325 kg of cementitious material per cubic meter. The remaining trench shall be backfilled to finished grade with backfill material.

Conduit runs shown on the plans to be located behind curbs may be installed in the street, within 0.9-m of, and parallel with the face of the curb, by the "Trenching in Pavement Method" in conformance with the provisions in Section 86-2.05C, "Installation," of the Standard Specifications. Pull boxes shall be located behind the curb or at the locations shown on the plans.

After conductors have been installed, the ends of conduits terminating in pull boxes, service equipment enclosures, and controller cabinets shall be sealed with an approved type of sealing compound.

At locations where conduit is required to be installed under pavement and if a delay to vehicles will not exceed 5 minutes, conduit may be installed by the "Trenching in Pavement Method."

#### **RIGID GALVANIZED STEEL CONDUIT, THREADED COUPLINGS AND ELBOWS**

The rigid galvanized steel (RGS) conduit, threaded couplings, and elbows shall conform to Section 86-2.05, "Conduit," of the Standard Specifications for Type 1 where shown on the plans.

#### **POLYVINYL CHLORIDE COATED RIGID GALVANIZED STEEL CONDUIT, THREADED COUPLINGS, AND ELBOWS**

The polyvinyl chloride (PVC) coated rigid galvanized steel (RGS) conduit, threaded couplings, and elbows shall conform to Section 86-2.05, "Conduit," of the Standard Specifications for Type 2 where shown on the plans.

#### **POLYVINYL CHLORIDE COATED RIGID GALVANIZED STEEL CONDUIT BODIES**

The polyvinyl chloride (PVC) coated rigid galvanized steel (RGS) conduit bodies shall conform to the following requirements before the PVC coating is applied:

1. The PVC-coated RGS conduit bodies shall conform to Federal Specification W-C-586D, and UL Standard No. 514B. The PVC-coated RGS conduit bodies zinc surfaces shall remain intact and undistributed on both the inside and outside throughout the preparation and application processing.

2. The PVC-coated RGS conduit bodies shall be "Hot-Dipped" galvanized inside and out after fabrication with "Hot-Dipped" galvanized threads. The zinc coating for PVC-coated RGS conduit bodies will be tested in accordance with ASTM Designation: A239.
3. The "Hot-Dipped" galvanized threads, the exterior, and the interior for the PVC-coated RGS conduit bodies shall have a urethane coated of a nominal thickness of 50 microns.
4. The PVC-coated RGS conduit bodies shall conform to the following requirements when the PVC coating is applied:
  - 4.1. All PVC-coated RGS conduit bodies shall conform to NEMA Standard No. RN-1.
  - 4.2. The bond between the coatings and the metal shall be greater than the tensile strength of the coatings.
  - 4.3. All PVC-coated RGS conduit bodies shall have an exterior PVC coating of a minimum thickness of 1 mm applied by dipping in liquid plastisol.
  - 4.4. All Hubs on PVC-coated RGS conduit bodies shall have a PVC sleeve extending one pipe diameter or 53 mm whichever is less. The inside diameter (I.D.) of the sleeve to be equal to the outside diameter (O.D.) of the uncoated pipe.
  - 4.5. Stainless steel encapsulated screws shall be supplied with all form 7 and form 8 PVC-coated RGS conduit bodies.
  - 4.6. The PVC coating on all form 8 PVC-coated RGS conduit bodies shall form a gasket-like flange of at least 8 mm wide and 1 mm thick covering the top of the conduit body around the opening.
  - 4.7. The PVC coating on all form 8 conduit body covers shall form a gasket-like flange of at least 8 mm wide and 1 mm thick covering at the bottom of the cover and mating with the flange of the conduit body.
  - 4.8. All PVC-coated RGS conduit bodies for conduits less than 103 mm shall be form 7 conduit bodies.

#### **LIQUID TIGHT FLEXIBLE METAL CONDUIT**

The liquid tight flexible metallic conduit shall conform to the following requirements:

1. The flexible metal shall be constructed of continuously interlocked strip and shall be coated with sunlight resistant PVC jacket.
2. The metal core shall be hot-dipped galvanized steel core with a heavy coating of zinc.
3. The jacket shall be resistant to weather, temperature, oil and chemical breakdown.
4. Conform to the provisions of NEC Article 351 under "Liquid-tight Flexible Metal Conduit".
5. UL listed for Safety 360.

### **10-3.10 UNDERGROUND RACEWAYS**

#### **DUCT BANKS**

Underground conduits shall be Type 1 encased in concrete. Concrete for conduit encasement shall be 35 MPa test with aggregate of 20 mm or smaller.

The concrete shall be colored red by the addition of 6 kg of red oxide powder to each cubic meter of mix. The coloring shall be thoroughly mixed into the concrete before pouring. Adequate spacers, tie-downs and bracing shall be provided to maintain conduits in place during the pouring of the concrete. Ducts shall be installed so as to drain to manholes.

All conduits entering and leaving the manholes shall be bonded together with copper bare conductor with ground clamp connected to system ground. All conduit connections shall be threaded. All approved connections shall be made with suitable conductive thread compound. After installation all conduits shall be checked for continuity and cleaned properly. Cleaning of conduit shall be done by the use of compressed air for sizes 41 mm and smaller, and by the use of mandrel and cleaning brushes pulled through each conduit for sizes larger than 41 mm. Prior to backfilling of the underground duct system, the Contractor shall provide a yellow (with black lettering) warning tape, 340 mm from the finished grade, stating "CAUTION-BURIED ELECTRICAL LINE".

### **10-3.11 SUPPORT HARDWARE FOR CONDUITS, CABLE TRAYS AND WIREWAYS**

#### **STAINLESS STEEL POWER-STUD ANCHOR**

Anchors shall be stainless steel body, fully threaded, torque controlled, power-stud, wedge expansion anchor with one-piece anchor assembly with the length identification code. The anchor assembly shall be manufactured from Type 316 stainless steel and shall have an expansion mechanism, which consists of a pair of interlocking independent wedges.

Anchors that have less than a 40 mm hole depth can be installed anywhere in the box. If the anchor will require a hole depth of greater than 40 mm, the Engineer will consult with the Structural Engineer of Record prior to approving the location and depth of the anchor. Due to the high compressive strength of the concrete in the superstructure, it may be difficult to drill.

Anchor Component	Component Material
Anchor Body	Type 316L Stainless Steel
Nut	Type 316L Stainless Steel
Washer	Type 316L Stainless Steel
Expansion Wedge	Type 316L Stainless Steel

### EMBED STRUT CHANNEL

Embed strut channels, as shown on the plans, shall conform to the provisions in Section 75-1.03, "Miscellaneous Bridge Metal," of the Standard Specifications and these special provisions.

Embed strut channels cast in pre-formed concrete shall be installed at the time of casting and not after. Embed struts shall be manufactured from 12-gage hot-dip galvanized rolled steel. Load ratings shall have a safety factor of 3. An electro-galvanizing and dichromate finishing process shall be applied after fabrication to achieve a 13  $\mu$ m electro-galvanizing plating. The channels shall be of a standard size to accommodate standard channel fittings and nuts.

### MOUNTING RACKS

Mounting racks shall be constructed from 12-gage steel channel. The steel shall be fabricated by a formed hot-dip galvanized rolled steel method and have a 13  $\mu$ m electro-galvanizing plating applied after fabrication. All fittings and hardware used for construction of the mounting racks shall be of steel with the same electro-galvanizing plating.

### THREADED BOLT SLEEVES AND BOLTS

Threaded bolt sleeves required for the navigation light mounting plate shall conform to the requirements in ASTM Designation: A 36 and installed by the concrete fabricator. The bolts shall conform to the requirements in ASTM Designation: A 37.

### HARDWARE

All hardware for fastening electrical equipment, materials, and devices, including but not limited to, bolts, nuts, washers, lock washers, fastening screws, expansion anchors, U-bolts and hold-down clamps shall be Type 316L stainless steel unless otherwise noted.

### CONDUIT AND TRAY SUPPORTS

Conduit support brackets, as shown on the plans, shall conform to the provisions in Section 75-1.03, "Miscellaneous Bridge Metal," of the Standard Specifications and these special provisions.

All anchors and fasteners for the conduits system and trays shall comply with the requirements of Section 10-3.14 "Seismic Anchoring" of these special provisions.

The Engineer shall consult with the Structural Engineer of Record prior to approving concrete anchors requiring a depth of greater than 40 mm. Support channels must be embedded in the pre-fabricated concrete girder sections for supporting all trays and all major conduit runs. The following tray and conduit weight tables must be used by the Contractor for determining the spacing of supports. The tables show the maximum probable mass of insulated copper conductors assuming maximum tray and conduit fill.

Conduit size in mm:	41	53	63	78	103
Mass in kg/m:	6.15	9	12.9	18.75	28.5

Tray size in mm:	305	610	762
Mass in kg/m:	37.5	75	93.75

Maximum tray support span shall be 4.74 meters.

Conduits shall be supported as shown on the plan otherwise, maximum conduit support span shall be 3.0 meters.

### **10-3.12 PULL BOXES, SPLICE BOXES AND JUNCTION BOXES**

Grout shall not be placed in the bottom of pull boxes.

In grade medium voltage pull box shall be pre-cast pull box, 2.6 m x 1.4 m. The box shall conform to all requirements in NEC, Article 370. Pull box cover shall be heavy traffic rated and shall read "High Voltage", permanently marked and readily visible.

Medium voltage cables shall only be spliced in pull boxes as shown on the plans, and as required to meet manufacturer's pulling tension requirements. A minimum of 6 m of cable shall be coiled in each pull box with 3 m of slack cable provided on each side of a splice. Cable splices shall be weatherproof, stress cones type, single conductor style. Splices shall not be pulled into conduits.

Splices shall be tagged with cable identification on permanent plastics marker tag. Cable identification will be provided by the Engineer.

#### **BARRIER PULL BOXES**

Type 9 and 9A barrier pull boxes shall be as shown on the plans and detailed on Standard Plans ES-9D, except the pull box shall have captive stainless steel cover screws.

#### **OUTDOOR BARRIER RECEPTACLES, OUTDOORS**

The receptacles to be installed in the barriers outdoors shall be rated 20 A, 120 V, weatherproof and with threaded caps which effectively seal the housing when not in use.

#### **NEMA TYPE 4X STAINLESS STEEL PULL BOXES**

The body and the cover plate of the NEMA Type 4X enclosure shall be made of 14-gage Type 304 or Type 316 stainless steel. The seams shall be continuously welded and ground smooth, no holes or knockouts. It shall have a seamless foam-in-place gasket that assures watertight and dust-tight seal. The gasket and adhesive shall be oil-resistant. All exterior hardware shall be Type 304 or Type 316 stainless steel.

The enclosure shall meet the latest edition of the following industry standards NEMA Type 4X Enclosure, UL870.

The box engraving, physical size and dimensions shall be as shown on the plans. The enclosure shall be manufactured by B-Line Systems, Chalfant, Hoffman or other approved manufacturer.

#### **NEMA TYPE 12 PULL BOXES SINGLE DOOR**

The NEMA Type 12 single door pull box shall conform to the following:

##### **Construction**

1. Enclosure bodies are either 14-gage or 16-gage steel. All doors are 14-gage steel.
2. Seams shall be continuously welded and ground smooth, no holes or knockouts.
3. Continuous hinge.
4. External screw door clamps are quick and easy to operate.
5. Door shall be removed by pulling heavy gage continuous hinge pin.
6. Oil-resistant gasket attached with oil-resistant adhesive and held in place with steel retaining strips shall be provided.
7. The box engraving, physical size and dimensions shall be as shown on the plans drawings.
8. Finish shall be white inside with ANSI 61 gray outside finish over phosphatized surfaces. Optional panels shall be white.

##### **Industry Standards**

1. UL 508 Type 12.
2. NEMA/EEMAC Type 12.
3. CSA Type 12.
4. ANSI/IEC/NEMA 60529, IP-65.

#### **NEMA TYPE 4X ENCLOSURES STAINLESS STEEL**

The body and the door of the NEMA Type 4X enclosure shall be made of 14-gage Type 304 or Type 316 stainless steel. The seams shall be continuously welded and ground smooth, no holes or knockouts. It shall have a seamless foam-in-place gasket that assures watertight and dust-tight seal. It shall have a body stiffener in the larger size enclosures. The gasket and adhesive shall be oil-resistant. Enclosure shall have rolled lip around three sides of

the door and all sides of the enclosure to assure a proper seal. All exterior hardware shall be Type 304 or Type 316 stainless steel. Enclosure shall have a hasp and staple for padlocking.

The door shall be removed by pulling stainless steel continuous hinge pin. The enclosure shall meet the latest edition of the following industry standards NEMA Type 4X Enclosure, UL508, and have a 2B finish.

The enclosure engraving, physical size and dimensions shall be as shown on the plans. The enclosure shall be manufactured by B-Line Systems, Chalfant, Hoffman or other approved manufacturer.

Proper air circulation in the cabinets to protect PLC equipment from suffocation. Isolated ground bus to connect instrumentation shields, and a ground lug for equipment ground.

### **10-3.13 CONDUCTORS, CABLES AND WIRING**

Splices shall be insulated by heat-shrink tubing of the appropriate size after thoroughly painting the spliced conductors with electrical insulating coating. On Yerba Buena Island, work shown on the plans related to YBI electrical utility relocations shall have splices insulated by "Method B".

The Contractor shall perform a high-voltage series lighting test consisting of the open circuit voltage of the connected constant current transformer between conductors and ground.

The high-voltage test shall not be performed on existing circuits or equipment. Non-testing of existing circuits and equipment shall not relieve the Contractor from the responsibility for malfunctioning of existing lighting circuits due to the Contractor making splices in or connecting to the circuits and such malfunctions shall be corrected at the Contractor's expense.

#### **600 VOLT SINGLE CONDUCTOR CABLE**

All 600-volt single conductor cable shall be the following unless otherwise noted on the plans. The cables shall be insulated with a EPR insulation rated for 600 volts. The cables shall be UL listed as Type RHH, RHW-2, or USE-2, VW-1 600 V. All cables No. 1/0 and larger shall be UL Type TC rated.

The conductor shall be soft annealed uncoated copper Class B stranded per ASTM B-8. The EPR insulation shall meet the requirements of ICEA S-95-658, NEMA WC-70, and UL Standards 44 and 854. The composite insulation thickness shall be as follows:

Conductor Size	EPR Thickness
No. 14 - No. 10	1.14 mm
No. 8	1.52 mm
No. 6 - No. 2	1.91 mm
No. 1 - No. 4/0	2.54 mm
250 kcmil – 500 kcmil	3.30 mm

The cable surface shall be printed in a contrasting color with the following information:

1. Manufacturers' name.
2. Plant number.
3. Conductor size.
4. Cable type.
5. Voltage rating.

The cable shall be manufactured by The Okonite Company, BICC Cables, Pirelli, or approved equal. Manufacturer shall furnish a notarized certificate of compliance to demonstrate cable furnished is in compliance with ICEA S-95-658, NEMA WC-70 and UL 44.

#### **600 VOLT MULTI-CONDUCTOR CABLE**

All 600 volt rated multi-conductor cables shall be the following unless otherwise noted on the plans drawings. The cables shall be insulated with ethylene propylene rubber, assembled as a multi-conductor cable with flame resistant fillers and binder tape with an overall PVC jacket. The cables shall be capable of operating continuously in both wet and dry locations at conductor temperature of 90 °C for normal operation, 130 °C for emergency overload rating, and 250 °C short circuit rating.

The conductors shall be soft annealed uncoated copper Class B stranded in conformance to the requirements in ASTM Designations: B 8. The single conductors shall be ethylene propylene rubber insulated meeting the requirements of UL 1581 and ICEA S-68-516. Color coding for sizes No. 10, 12, 14 and 16 AWG shall conform to the requirements in ICEA Method I Table K-2. Sizes No. 8 and larger shall be numerically coded using ICEA Method 4. The insulation thickness shall be as follows:



Conductor Size	EPR Thickness
No. 16	0.64 mm
No. 14 - No. 10	0.76 mm
No. 8 - No. 2	1.14 mm
No. 1/0 - No. 4/0	1.39 mm

The insulated conductors (and grounding conductor if required) shall be cabled together with flame resistant fillers and binder tape. The jacket shall be extruded PVC meeting the physical and dimensional requirements of ICEA S-68-516. The cable shall pass the vertical tray flame test requirements of IEEE 383 and 1202 and UL 1277. The cable shall be UL listed as Type TC.

The cable surface shall be printed in a contrasting color with the following information:

1. Manufacturers' name.
2. Plant number.
3. Number of conductors.
4. Conductor size.
5. Cable type.
6. Voltage rating.

The cable shall be manufactured by The Okonite Company, BICC Cables, Pirelli, or approved equal. The manufacturer shall furnish a notarized certificate of compliance to demonstrate cable furnished is in compliance with ICEA S-95-658, NEMA WC-70 and UL 1277.

#### **SHIELDED TWISTED PAIR AND TRIAD CABLES**

All shielded twisted pair No. 18 (0.832 mm<sup>2</sup>) multi-conductor communication cables (fifty pairs, six pairs and two pairs) and twisted triad shall be stranded annealed copper (per ASTM Designations: B 3 and ASTM B 8). The insulated single conductors shall be twisted into pairs, triads or multiple conductor components. The insulation shall be flame-retardant cross-linked polyethylene with color code in conformance with the requirements in ICEA Method 1. The insulation shall be 0.76 mm nominal.

The cable components are cabled with non-hygroscopic fillers, as necessary, and an overall binder tape. The individual pairs or triads shall be shielded with a 0.19 mm aluminum/polymer tape with tinned copper drain wire applied helically over the pairs or triads. The overall shield shall be a 0.19 mm aluminum/polymer tape with tinned copper drain wire applied helically over the cable core.

The overall jacket shall be 2.8 mm flame-retardant and sunlight resistant polyvinyl chloride (PVC). A nylon ripcord shall be applied longitudinally under the overall jacket to facilitate jacket removal.

The cable shall be suitable for cable tray use and have the following ratings and listings:

1. UL Type TC - 600 volt.
2. UL Class XL.
3. UL Subject 13 and 1277.
4. IEEE 383 and 1202.
5. ICEA S-95-658/NEMA WC-70 - 600 volt.

The cable shall be manufactured by Belden Cable, The Okonite Company, BICC Cables, Pirelli, or equal. The manufacturer shall furnish a notarized certificate of compliance to demonstrate cable furnished is in compliance with ICEA S-95-658/NEMA WC-70 and UL 44.

#### **Communication Cable Splices**

Splices shall be done only as approved by the Engineer. Splices for shielded No. 18 multi-conductor, twisted pair cables shall be as recommended by the cable manufacturer and suitable for the environment that the splice is located. The Contractor shall submit the cable manufacturer's recommended splicing method to the Engineer for approval prior to using the method. The Engineer shall approve splice locations. The splicing kits shall be manufactured by Raychem, 3M or other approved manufacturer.

#### **15 kV CABLE**

The 15kV shall be installed at a minimum depth of 1.1 m. The 15 kV shielded single conductor power cable shall be 15 kV, 133 percent insulation rated power cable designed to operate at conductor temperatures of 105 °C

normal, 140 °C emergency, and 250 °C short circuit conditions as defined by ICEA S-93-639 NEMA WC-74 and (UL) Standard 1072. The cable shall be suitable for installations above or below grade, indoors or outdoors, and in wet or dry locations. The qualifying cable shall be (UL) labeled as MV-105, Sunlight Resistant and for cable tray use in accordance with UL Standard 1072.

### **Conductors**

The conductors shall be compressed, Class B stranded copper. The copper conductors shall consist of all bare strands or tin-coated strands in the outer layer. Conductors shall be unbroken for the full length of the reels specified in the Purchase Order. Reels containing splices will be rejected.

### **Conductor Shield**

The conductor shielding shall consist of an extruded, black-colored, nonmetallic semiconducting or non-conducting energy suppression thermosetting compound material.

### **Insulation**

The insulation shall be a discharge resistant, ethylene propylene (EP) based compound and be listed by Underwriters Laboratories. The minimum average thickness of the insulation shall be 5.59 mm. The manufacturer shall perform the Insulation Corona Discharge Resistance Test of ICEA S-93639 tested in conformance with the requirements in ASTM Designation: D 2275, "Standard Test Method for Voltage Endurance of Solid Electrical insulating materials Subjected to Partial Discharges (Corona) on the Surface," and submit the results to the Engineer before acceptance of the cable.

### **Insulation Shielding**

The insulation shielding shall consist of a nonmetallic semiconducting EPR material extruded directly over the insulation and a 0.12-mm bare copper tape. The nonmetallic semi conducting layer shall be black-colored. The layer shall be free stripping from the EP insulation.

### **Metallic Shield**

The metallic shield shall be coated copper tape, helically applied with a minimum overlap of 12.5 percent, directly over the nonmetallic layer.

### **Overall Jacket**

The overall jacket shall be extruded black-colored Polyvinyl Chloride (PVC) material and shall be surface printed as required by UL Standard 1072.

### **Production Testing**

Production testing shall consist of the following:

1. Continuous DC Spark testing of the non-conducting conductor shield.
2. AC Voltage Withstand test for a 5-minute duration, of each finished cable at 44 kV.
3. Volume Resistivity of the insulation shield.
4. DC Resistance of all insulated conductors.
5. Dimensional Verification of all extruded layers.
6. Absence of water in conductors and interfaces confirmed.

### **Cable Accessories**

The manufacturer of the splices and terminations shall have a minimum of 15 years specialized in manufacturing of heat shrinkable cable accessories. The manufacturer of the splices and terminations shall be the Raychem Corporation, 3M, Elastimold or approved equal.

The cable splicer shall have a minimum of five years experience and be certified by the splice and cable termination manufacturer. The splicer shall provide a resume documenting his experience and qualifications to be approved on this project by the Resident Engineer.

### **Cable Terminations**

The termination shall be IEEE 48, Class 1, heat-shrinkable cable terminations in kit form, capable of properly terminating cables specified in this section. Terminations for single-conductor cables shall consist of heat-shrinkable radiation crosslinked high dielectric constant linear stress relief material and heat-shrinkable radiation

crosslinked non-tracking outer insulation. Terminations shall contain high relative permittivity electric stress relief mastic for insulation shield cutback treatment and a heat-activated sealant for environmental sealing.

In addition to the components described above, the conductor kits shall contain heat-shrinkable components to seal the cable jacket, the phase conductor, ground wire and re-jacket phase and ground conductors.

### **Cable Splices**

Splices of high voltage cable shall be avoided if possible. Where necessary, because of constructability reasons, splice locations shall be approved by the Engineer. In general, splices of high voltage cables shall be scheduled so that the length of cable between splices is approximately 400 meters. All 15 kV splices shall be installed as shown on the plan sheets. A splice shall be scheduled at the construction boundaries. Where possible, longer cable runs are encouraged. The Splices, where necessary, shall be IEEE 404, heat shrinkable cable splices in kit form, capable of properly splicing cables specified in this section. Splice kits shall contain all necessary components to reinstate primary cable insulation, metallic shielding and grounding systems and overall jacket to the equivalent of the cable itself. Splices shall be of a uniform cross-section and shall consist of heat-shrinkable radiation crosslinked insulation. The outer insulating layer shall be bonded to a conducting layer for shielding. The splice shall be re-jacketed with a heavy-wall, heat-shrinkable sealant lined sleeve to provide a waterproof hot melt adhesive seal. Splices shall contain heat-shrinkable radiation cross-linked high dielectric constant linear stress relief material. Splices shall contain a high relative permittivity electric stress relief mastic for insulation shield cutback treatment and a heat-activated sealant for environmental sealing. Kits shall allow splicing cables with different types of insulation, conductor sizes, and shielding construction. Kits shall accommodate commercially available standard connectors.

### **Cable End Sealing Caps**

The end seal caps shall be heat-shrinkable crosslinked polymeric end sealing caps capable of sealing cables specified in this section. End caps shall be pre-coated with a heat activated sealant.

### **DC High Potential Test**

Perform DC high potential test of each conductor in accordance with NEMA WC 5. Contractor shall furnish a report for the engineers' approval documenting the test results.

### **Cable Pulling**

The Contractor shall pull conductors by hand, or by mechanical aids, such as winches or other power actuated pulling equipment, if permitted. Prior to installation of conductors by mechanical aids, the Contractor shall test the conductors in accordance with Section 10-3.09, "Conductors, Cables, and Wiring," of the special provisions. The Contractor shall submit the manufacturer's recommended procedures for pulling the conductors to the Engineer for review and approval at least 20 days prior to installing the conductors.

If a mechanical aid is allowed then a tension measuring device or breaking swivel shall be placed between the end of the conductor grip and pull rope to ensure that the tension does not exceed 100 percent of recommended tension. The mechanical aid shall have a ball bearing swivel to prevent the conductors from twisting during installation.

### **CLOSED CIRCUIT TELEVISION CABLES**

Television control (TVC) cable shall consist of 15 No. 18 conductors, unshielded and with an outer jacket. Each conductor shall have a minimum of 16 tinned copper strands with a minimum of 400-µm insulation. Individual conductor insulation shall be chrome PVC with a nominal thickness of 1 mm. The outside diameter of the jacket shall not exceed 14 mm.

Color code for TVC cable shall be:

1. Black
2. White
3. Red
4. Green
5. Orange
6. Blue
7. White/ Black
8. Red/ Black
9. Green/ Black
10. Orange/ Black

11. Blue/ Black
12. Black/ White
13. Red/ White
14. Green/ White
15. Blue/ White

Television power (TVP) conductors shall consist of three No. 14 {120 V(ac), 120 V(ac) neutral, equipment ground} individually insulated, stranded copper conductors in conformance with the provisions in Section 86-2.08, "Conductors," of the Standard Specifications. The conductors shall be color coded black, white, and green respectively.

Television control power (TVCP) cable shall consist of twelve No. 18 conductors, unshielded with an outer jacket. Each conductor shall have a minimum of 16 tinned copper strands with a minimum of 400  $\mu$ m insulation. Individual conductor insulation shall be polyvinyl chloride (PVC), rated for 300 V (see color code below). The jacket shall be chrome PVC with a nominal thickness of 1 mm. The outside diameter of the jacket shall not exceed 12 mm.

Color code for TVCP cable shall be:

1. Black
2. White
3. Red
4. Green
5. Orange
6. Blue
7. White/ Black
8. Red/ Black
9. Green/ Black
10. Orange/ Black
11. Blue/ Black
12. Black/ White

Television video (TVL) cable shall consist of an RG-6/U coaxial cable. Each cable shall be provided with a solid No. 18 copper clad steel center conductor and shall conform to the following requirements:

Electrical	TVL
Capacitance (Pico farads/m nominal)	54.1
Impedance (ohms-nominal)	75
Velocity of propagation (nominal)	84%
D.C. loop resistance (ohms/100 m)	11.7

Attenuation at 20 °C:

Frequency (MHz)	TVL (Nominal dB/ 100 m)
5.0	1.90
30	3.64
108	6.40

Physical Specifications	TVL Nominal O.D. (mm)
Copper-clad steel center conductor	1.00
Foam polyethylene dielectric	4.57
Sealed APA tape with 1.6 mm overlap	4.75
Woven aluminum braid	5.39
Sealed APA tape with 1.6 mm overlap	5.49
Woven aluminum braid	6.12
Flooding compound	
PVC outer jacket	7.55

(APA = Aluminum polyolefin and aluminum with adhesive)  
TVL cable shall be terminated with BNC plug connector at both ends.

#### **Coaxial Cable Connectors (TVL Coaxial Cables)**

Coaxial cable connectors for attaching Type TVL coaxial cable shall meet the following requirements:

1. Electrical:

Impedance	75 $\Omega$ nominal
Return loss	30 dB minimum (5 MHz to 300 MHz)
Rated working voltage	500 V rms

2. Mechanical:

Type of construction	Integral sleeve BNC
Method of attachment	Crimp-crimp
Composition	Bodies – alloy Finish - chromate conversion, silver plating, or other corrosion resistant metal

3. Environmental:

Temperature	-10°C to +50°C
Moisture	Weather resistance design

The mating connector for TVL cable in junction box shall be provided. The center contact of this jack shall be beryllium copper.

#### **Testing**

Testing of TVL cables and connectors shall be performed in accordance with the provisions in Section 86-2.14B, "Field Testing," of the Standard Specifications and these special provisions.

Cable lengths found to have faults shall be replaced and re-tested. The Contractor shall dispose of the removed faulty cable.

Prior to the beginning of work, each length of coaxial cable shall be tested for attenuation and faults to ensure compliance with specifications contained herein using a time domain reflectometer (TDR). For the purpose of these special provisions, a fault in a long length of cable is defined by one or more of the following:

1. Return loss measurements indicating that attenuation exceeds 3 dB at 5 MHz to 30 MHz in a portion of cable less than 3 m long.
2. A return loss measurement indicating that there is a short in the cable.
3. A return loss measurement indicating a cut or open circuit in the cable.
4. A visual inspection that reveals exposure of or damage to the cable shielding.

#### **10-3.14 SEISMIC ANCHORING**

All electrical equipment including lighting fixtures cable trays, and raceways shall be mounted and braced to withstand, without damage, seismic acceleration forces in both horizontal and vertical directions. The forces in the vertical direction shall be at least 66 percent of those in the horizontal direction. The entire seismic anchoring installation for the electrical equipment, materials, and devices shall meet all applicable seismic requirements of the latest version of the California Building Code (CBC). The equipment anchoring methods and details are to be submitted for review and approval by the Engineer. The equipment anchorage details shall be coordinated with the equipment mounting provision, prepared and stamped by a licensed civil engineer in the State of California. The attachment methods shall not damage any structural member. The installation shall meet requirements of the Essential Services Building Seismic Safety Act, Senate Bill 230, Title 24.

### **10-3.15 BONDING AND GROUNDING**

Bonding and grounding shall conform to the provisions in Section 86-2.10, "Bonding and Grounding," of the Standard Specifications and these special provisions.

Bonding jumpers in standards with handholes and traffic pull box lid covers shall be attached by a UL listed lug using 4.5-mm diameter or larger brass or bronze bolts and shall run to the conduit or bonding wire in the adjacent pull box. The grounding jumper shall be visible after the standard has been installed and the mortar pad and cap have been placed on the foundation.

Standards without handholes shall have bonding accomplished by jumpers attached to UL listed ground clamps on each anchor bolt.

For slip base standards or slip base inserts, bonding shall be accomplished by jumpers attached to UL listed ground clamps on each anchor bolt, or a UL listed lug attached to the bottom slip base plate with a 4.5-mm diameter or larger brass or bronze bolt.

Equipment bonding and grounding conductors are required in conduits, except when the conduits contain only combinations of loop lead-in cable, fiber optic cable, or signal interconnect cable. A No. 8 minimum, bare copper wire shall run continuously in circuits. The bonding wire size shall be increased to match the circuit breaker size in conformance with the Code, or shall be as shown on the plans. Conduits to be installed for future conductors, may omit the copper wire.

Bonding of metallic conduits in metal pull boxes shall be by means of bonding bushings and bonding jumpers connected to the bonding wire running in the conduit system.

### **10-3.16 SERVICE**

Continuous welding of exterior seams in service equipment enclosures is not required.

Circuit breakers shall be the cable-in/cable-out type, mounted on non-energized clips. All circuit breakers shall be mounted vertically with the up position of the handle being the "ON" position.

#### **SERVICE EQUIPMENT ENCLOSURE (MODIFY)**

Circuit breakers used as service disconnect equipment shall have a minimum interrupting capacity of 10,000 A, rms, for 120/208 V(ac) service and for the 120/240 V(ac), single phase, three wire system.

Service equipment is similar to Type III-CF except equipment is to be for 120/208 V(ac), three phase, four wire system and Type III-AF for the 120/240 V(ac), single phase, three wire system. The service pedestal shall meet all requirements of Hetch-Hetchy Water and Power.

#### **PAD MOUNTED TRANSFORMER**

Liquid filled transformers shall conform to ANSI C57.12.27, be three phase, pad mounted, self-cooled transformer unit. The transformer pad shall be concrete and shall be detailed as shown on the plans. Oil used in liquid filled transformers shall conform to IEEE C57.106.

The transformer tank and terminal compartment shall be bolted together to form an integral outdoor weather-resistant type unit. The terminal compartment shall be completely enclosed with one high voltage and one low voltage compartment door. The compartment doors shall use no bolts, screws, or other fastening devices which are externally removable, with the exception of hex head bolts for security, that provide access to the energized parts within the enclosure. The enclosure shall be tamper-resistant design meeting the requirements of ANSI C57.12.28-1988, "Padmounted Equipment-Enclosure Integrity for Switchgear and Transformers".

Full height, air-filled incoming and outgoing terminal compartments with hinged doors shall be located side by side, separated by an isolating barrier. The hinged doors shall be attached with stainless steel hinges and hinge pins and incorporate a three point latching mechanism operated by the low voltage door handle, with door stops on both doors to secure doors during servicing. To facilitate making connections and permit cable pulling, the doors and compartment hood shall be removable. A removable door sill shall be provided to permit rolling or skidding the unit into place over conduit stubs in foundation.

The high voltage compartment shall be on the left, and shall be accessible only after the door to the low voltage compartment has been opened. The high voltage compartment shall enclose the high voltage bushings or bushing wells and provide for incoming cable from below. The high voltage equipment shall be arranged for a primary selective radial feed as shown on the drawings.

The unit shall be equipped with the following standard accessories:

1. A weather cover over the enclosure is to be provided with additional hold-down hardware to secure it more firmly to the enclosure.
2. Four lifting hooks.
3. Bolted-on terminal compartment minimum of 457 mm deep with removable front sill.

4. Hinged, lift-off cabinet doors.
5. Interlocked (hex-head) bolt/padlock handle to operate a cam assembly which is to be part of the three point door latching mechanism.
6. Tank ground pads (one in high voltage pad and one in low voltage pad).
7. Steel high/low voltage compartment barrier.
8. Two 9.5 mm hex head bolts which must be removed from the steel high/low barrier before the HV door can be opened.
9. Nameplate – A durable metal nameplate made of corrosion-resistant material and conforming to ANSI/IEEE C57.12.00-1980 affixed to each transformer.
10. Oil level/fill plug and oil drain plug.
11. Self-actuating pressure relief device to relieve slow pressure build-up shall be provided that will automatically vent when pressure reaches 69 kPa  $\pm$  13.8 kPa and recloses when pressure falls to 41.4 kPa.
12. Removable neutral ground strap.
13. Five-legged core and coil assembly suitable for grounded WYE-grounded WYE connections, DELTA-ground WYE connections or DELTA-DELTA connections as required.
14. Handhole cover bolted onto tank top, protected by weather cover.
15. Tap changer handle for de-energized operation only.
16. Drain valve with sampling device.
17. Liquid level gauge.
18. Dial type thermometer.
19. Provision for pressure vacuum gauge.

#### **High Voltage Termination**

The high voltage termination shall occur by providing a dead front panel. The dead front panel shall have externally clamped high voltage epoxy bushing wells with load break 200 A inserts. The Contractor shall provide load break elbows for the size and type cable shown on the plans.

#### **High Voltage Switching**

High voltage switching shall be by oil immersed switching and conform to the following:

1. Designed for pad mounted transformers enabling an operating person to quickly isolate a line fault in a radial feed system, while maintaining full service continuity. (Under Bid Alternate No. 2 it would be a primary selective radial feed system).
2. Available in 200 A, hook stick operable. Available at the following ratings, as defined by: ANSI Standard C37.72, 1987; American National Standard Requirements for Manually operated, Dead Front Padmounted Switchgear with Load Interrupting Switches and Separable Connectors for Alternating-Current Systems.
3. The electrical characteristics of switch:

Ratings	200 A
Maximum Voltage	15.5 kV 10 (Line-Ground) 125 kV (Impulse Withstand Voltage)
Continuous and Interrupting Current	200 A
Momentary & Making Current	12 kA (Sym) 19.2 kA rms (Asym)
60 Hz Withstand Voltage	Design: 60 kV Production: 40 kV
Corona Extinction Voltage	19 kV rms Mechanical Operations: 500 (plus)

#### **High Voltage Fusing**

The high voltage shall include full range current limiting fuses consisting of a general purpose (CLT), fuse mounted in a loadbreak draw-out dry fuse well. The current limiting fuse shall be designed to limit both the current magnitude and the energy associated with low impedance faults.

Fuses shall have continuous current ratings sized per the manufacturer's recommendation for the indicated kVA, impedance and primary voltages.

### **High Voltage Surge Arresters**

The transformer shall be designed with fusible switch radial feed with dead front arresters.

### **Low Voltage Terminations**

The low voltage compartment shall be arranged for cabling from below. Three line externally clamped low voltage epoxy bushings and one insulated neutral bushing with an externally removable ground strap shall be supplied. The bushings shall be supplied with threaded copper studs and NEMA four-hole rotatable spade type terminations and standard NEMA spacing and drilling.

### **Transformer Testing**

Tests shall be made on all transformers. The numbers shown do not necessarily indicate the sequence in which the tests shall be made. All tests shall be made in accordance with the latest revision of ANSI Standard Test Code C57.12.90, where applicable. The following testing shall be performed:

1. Transformers shall pass the following routine electrical tests:
  - 1.1. Ratio Test.
  - 1.2. Demagnetization Test.
  - 1.3. Applied Voltage Test of High Voltage.
  - 1.4. Applied Voltage Test of Low Voltage.
  - 1.5. 400 Hz Induced Voltage Test.
  - 1.6. Iron loss and Exciting Current Test.
  - 1.7. Impedance and Load loss Test.
  - 1.8. Full Wave Impulse Test.
2. Transformers shall pass a Mechanical Leak and Pressure Test on tank and coolers.
3. Design tests are not required to be repeated unless the design of the transformer is changed so as to modify the reliability of predicated results. The following ANSI basic design tests shall be made on a sufficient number of transformers and ratings to demonstrate compliance with these standards:
  - 3.1. Short circuit.
  - 3.2. Audible sound level.
  - 3.3. Temperature rise.
  - 3.4. Power factor.

Certified copies of actual loss data for the standard tests and test data on basic design shall be furnished to the Engineer and Hetch-Hetchy Water and Power.

### **Installation**

The transformer pad shall be set for at least 21 days before setting transformer unit.

The installation of the transformer must conform with the following requirement, and shall be approved by the Engineer and Hetch-Hetchy Water and Power:

1. Equipment and Neutral Grounding: The system neutral ground shall be made at transformer neutral bushing only. The neutral grounding shall not be grounded at the service switchboard. The pad ground grid and the in-building ground shall be tied together with conductor(s) run with the service feeder as shown in the diagram on the plans.
2. Setting, Leveling, and Fastening Equipment: The transformer unit shall be set on leveled nuts on the pad bolt inserts with a crane (use of forklift for this purpose is prohibited). After proper setting of the transformer complete the bolting of the unit. Grout under transformer base the entire perimeter of the transformer tank and the primary-secondary compartments. After the grout has set, lower insert bolt nuts 1/4 turn and tighten fastening nuts.

### **Marking and Identification**

The Contractor shall affix warning signs centered on the outside of the primary compartment door, 100 mm to 150 mm above the transformer base, at each transformer, with four 6 mm diameter bronze rivets.



### THREE PHASE MANUALLY OPERATED LOAD-INTERRUPTING FUSED SWITCH ASSEMBLY

This specification applies to a three-phase, group operated, 60 Hz, subsurface, load interrupting switches with ratings of 200 A and 15.5 kV, and utilizing separable insulated connectors mounted on the bottom.

When the following standards referred to in this document are superseded by a revision, the latest revision shall apply. Switch shall meet all requirements of the following:

1. C37.71-1984 ANSI Requirements for three-phase Manually Operated Subsurface Load-Interrupting Switches for Alternating-Current Systems, or latest version.
2. ANSI/IEEE Std 386-1977, Separable Insulated Connectors for Power Distribution Systems above 600 V, or latest version.

The following definition of terms contained in this specification, or in other standards referred to in this document, are not intended to embrace all the legitimate meanings of the terms. They are applicable only to the subject treated in this specification.

**Bus** (as used in this specification).--A three-phase junction common to two or more ways.

**Subsurface Switch.**--A submersible switching assembly suitable for application in a below-grade enclosure that does not allow space for personnel access and is subject to flooding.

**Surface Operable.**--A term indicating that the switch and its accessories are operable from above grade.

**Way.**--A three-phase circuit entrance to a switching assembly.

**Switched Way.**--A way connected to the bus through a three-pole, group-operated switch.

**Tapped Way.**--A way solidly connected to the bus.

Load interruption arcing shall take place in a vacuum to keep insulation clean and system switching transients to a minimum. The switch shall utilize vacuum interrupters having load break capabilities and shall have minimum life of 10,000 full 600 A interruptions without changing insulation, relieving pressure or replacing parts.

The three-phase load-interrupting fused switch assembly shall meet the requirements in the following table:

Switch Assembly Characteristics Table

Parameters	Value
Insulating medium	10C transformer oil
Nominal voltage	15 kV
Maximum design voltage	15.5 kV
BIL phase-to-phase and phase-to-ground	125 kV
BIL across open contacts	95 kV
One minute withstand (64 Hz)	34 kV
Continuous current (maximum in amps)	50 at 15.5 kV
Load switching	600 A
Fused way continuous current	50 A at 15.5 kV
Switch momentary & make & latch	20,000 A asymmetrical
Switched way with current limiting fuses	50,000 A symmetrical
Number of 600 A full-load switching operations	10,000

#### Fusing

Fusewells shall be canister type utilizing drywell fuse types. The design shall eliminate the possibility of fuse removal under load.

The fuse assembly shall be designed to eliminate the possibility of removing the fuse with the switch handle in the closed position. The design shall include a physical barrier that moves out of the fuse removal path with the opening of the switch handle.

The fusewells shall accommodate full range fuse combinations covering all currents up to and including 50 A continuous at 15.5 kV.

Provide with 6 A, 15 V x-limited current limiting fuse.

#### Bushing

All internal switch bussing shall be copper.

### **Grounding Provision**

One stainless steel grounding pad with a 12.7 mm 14 NC hole, 11.1 mm deep, shall be provided for each way and shall be located near the center bushing of each way.

### **Manual Operating Provisions**

Manual operating handles shall move in to close and out to open. The direction of operation shall be apparent.

Manual operating handles shall be located where they can be operated either to open or to closed positions from above with standard live-line tools. The force required to operate the handle shall be such that one man in a standing position can readily operate it without standing directly below the switch.

The switch mechanism shall be designed so that operation does not require any special skills, and the closing and opening speeds of the contacts are independent of the speed at which the operating handle is operated.

Manual operating handles shall be capable of being padlocked in both the open and closed positions.

### **Switch Operation Mechanism**

The switch shall be equipped with an internal operating mechanism design so that speed of opening and closing of the interrupter contacts will be independent of the external operator. All contacts of the three phases shall be operated simultaneously with no possibility of single phasing due to teasing of switch handle.

The switch shall be quick-make, quick-break type. Contacts shall be stable in open and closed positions without the use of mechanical latches, sear pins or detents.

### **Position Indicators**

Switches shall be provided with position indicators or other suitable means that clearly and positively indicate the open and closed positions of the contacts.

The indicators shall be visible from above.

### **Insulating Medium Quality Indicators**

Procedures or devices that require exposing the insulating medium to the outside environment shall not be used.

Provision shall be made for personnel to readily determine safe insulating liquid level with the switch energized.

Low insulation level indication device shall have no moving parts and shall display "LOW OIL" with white letters against a red background when insulation falls below safe level.

### **Tank Construction**

The tank and all appurtenances shall be made of AISI 304 stainless steel completely welded using AISI 308L filler to maintain corrosion resistance properties.

All bushings shall be welded and mounted on the top of the tank.

All tank penetrations shall be double "O" ring sealed.

Switch tanks shall be equipped with mounting provisions (such as support rails) that shall include provisions for anchoring the tank to the ground. Hot dip galvanized 305 mm high support stand furnished with the switch suitable for bolting to the transformer pad.

Lifting lugs of AISI 304 stainless steel shall be welded to the tank so that the switch will remain level when being lifted. The lugs shall be designed and located to avoid interference between lifting slings and any attachments (bushings and switch handles).

### **Termination**

The switch bushings shall accommodate cable termination in accordance with ANSI/IEEE Std 386-1977[3] or latest revision.

### **Bushing Designation**

The switch bushing shall be identified and legibly marked adjacent to each bushing with the appropriate phase designation, using a nameplate of stainless steel.

### **Nameplate**

A nameplate of stainless steel shall be provided. The nameplate shall be tack welded securely to the top of the tank by means of AISI 308L stainless steel filler. All letter, schematics and numbers shall be photo engraved on the nameplate. The nameplate shall contain at least the following information:

1. The word "Switch"
2. Name of manufacturer
3. Date of manufacturer (month and year, for example, 03-09)
4. Serial number
5. Model number or style number
6. Rated maximum voltage
7. Rated impulse withstand voltage
8. Rated continuous current
9. Rated load interrupting current
10. Rated momentary current
11. Rated making current
12. A three-line bushing-oriented schematic diagram, using standard symbols
13. Total weight (including insulating medium)
14. Type and quantity of insulating medium

### **Testing**

Tank: The finished tank will be pressurized to 48.3 kPa and tested for leaks using suitable leak detection methodology.

Electrical: AC hi-pot at 34 kV for one minute phase-to-phase, phase-to-ground, and across open contacts on all ways.

Continuity test all circuits.

### **Shipping Requirements**

1. Preparation: The switch shall be completely assembled, including the correct amount of insulating medium. Switches shall be properly packaged and braced to prevent damage during shipment.
2. Documentation: Instructions and checklists for the inspection, installation and maintenance of the switch shall be provided.
3. Field Inspection: Upon receipt of this equipment a thorough inspection should be performed. If any damage is found, a claim shall be filed immediately with the transportation company that delivered the equipment. Your manufacture representative should also be contacted. With the equipment unpacked, a thorough inspection can be performed.

Check liquid level gage (see Section 5A). Check to see that there is no leakage of dielectric fluid from switch tank. If any liquid is found leaking from the switch tank, call the manufacturer immediately. Inspect the switch tank face for any damage to bushings, parking stands, and switch handles.

4. Handling: This equipment is liquid filled and quite heavy. It shall be handled with great care by trained personnel using well maintained material handling equipment in good condition and of adequate capacity. Check the switch unit nameplates for total weight in kilograms before selecting handling equipment. As long as the switch unit is still strapped to its pallet it may be moved by a forklift. Once the unit has been unbolted it must be moved by crane. Lifting lugs have been provided on both sides of the switch body for an even, level lift using a sling and crane.

Switch unit shall be lifted slowly and smoothly to avoid shock loading the switch unit or lifting equipment. At no time should any persons be allowed under suspended load.

5. Storage: Although this equipment is designed for outdoor use, sheltered storage should be provided to preserve its "as new" appearance. Prolonged storage in direct sunlight and extreme heat can subject the unit to high internal pressures. Bushing covers are provided with each new unit, these covers shall be used to protect the bushings from chips, scratches and oxidation whenever the unit is being stored.
6. Installation: The switch is shipped from the factory ready for installation. Provide unit with a hot dip galvanized mounting stand. Installation is accomplished by simply bolting the switch and stand into properly prepared vault. It is very important to have this equipment securely bolted down or it can float when fully submerged. It is also very important to have the switch and stand properly grounded. Ungrounded or improperly grounded equipment can be subject to galvanic corrosion.

### **Pre-Shipping Testing**

The three phase manually operated load-interrupting fused switch assembly shall receive an AC hi-pot test based on BIL rating prior to shipping, at the following levels:

1. BIL rating across open contacts shall be: 95 kV, 125 kV and 150 kV
2. Applied AC hi-pot voltage kV duration for:

- 2.1. Phase to phase: 36/1 Min, 42/1 Min and 50/1 Min
- 2.2. Phase to ground: 36/1 Min, 42/1 Min and 50/1 Min
- 2.3. Across open contacts: 36/1 Min, 42/1 Min and 50/1 Min

The three phase manually operated load-interrupting fused switch assembly may be given an AC hi-pot to these levels after installation. For DC hi-pot test on cables, the cables shall be disconnected from the switch unit and parked per your standard procedures. The cable disconnection is recommended because the vacuum contacts can emit sufficient microamperes during DC high potential testing to give an improper indication of actual cable installation leakage.

### **10-3.17 STRUCTURE GROUNDING**

Two 250 kcmil or No. 4/0 bare grounding conductors must be exothermically welded to the 500 kcmil main grounding conductor and ran to the foundation footing of all bents and pier columns as shown on the plans. All bridge electrical components shall be grounded to the main grounding system as shown on the plans.

Grounding conductors shall be stranded soft drawn bare copper meeting the requirements of the ASTM Specifications.

The regulatory requirements which govern the work of this Section include the following governing Codes and Standards:

1. American Society for Testing and Materials (ASTM):
  - 1.1. ASTM Designation: B-3, Soft or Annealed Copper Wire
  - 1.2. ASTM Designation: B-8, Concentric-Lay Stranded Copper Conductors
  - 1.3. ASTM Designation: B-33, Tinned Soft or Annealed Copper Wire for Electrical Purposes
2. Federal Specification QQ-W-343, latest revision, Wire, Electrical, Copper, Uninsulated.

### **10-3.18 ELECTRICAL EQUIPMENT IDENTIFICATION AND LABELINGGENERAL**

The Contractor shall furnish materials and labor as required for the complete identification and labeling of existing and new conduits, trays and electrical equipment as shown on the accompanying drawings, circuit and conduit schedules. The Contractor shall provide labeling materials and labor as required to completely label components of all electrical systems, whether specifically called for or not and whether provided by the Contractor, the Department or others.

The Contractor shall verify that all electrical equipment, conduits and trays, whether furnished by the Contractor, the Department or others, are provided with permanent identification or labeling. All labeling not already provided shall be furnished and installed by the Contractor. Handwritten and non-permanent labels already installed by others that do not meet the requirements of this specification shall be removed and new labeling installed per these requirements.

The intent of the final labeling is to allow the Department or persons contracted by the Department to identify any part of the electrical system through physical identification of electrical components at the specified point without the use of electrical, electronic or mechanical means of identification.

Device labels shall be installed on the exterior of devices, when possible. Device labels may be installed on the interior of a device at the primary access point. Labels shall be installed in such a position as to be visible during normal maintenance of the electrical systems. Labels shall be installed on trays and conduits every 10 meters when visible. Labels shall be installed at every point of transition between conduits, cable trays and access points

To maximize the legibility, all labels shall be printed or generated by a mechanical device, and shall not be written by hand. No handwritten or non-permanent labels are allowed. Labels in exterior spaces shall be able to withstand extended exposure to the outdoor elements and shall have a useful life equal or greater to that of the component labeled.

### **SUBMITTALS**

All submittals shall be made to the Engineer.

The Contractor shall submit physical samples of each style or type of labeling to be used for each application, including the actual numbering to be used in completing the labeling. Numbering shall be printed on each label and shall include the font, font size, pitch and shall be printed by the printing method to be used by the Contractor in completion of the labeling.

The labeling samples are intended to represent the quality and workmanship to be provided by the Contractor in the field.

### **LABELING OF ELECTRICAL EQUIPMENT**

The Contractor shall provide and install nameplates on all electrical equipment as identified on the plan sheets. All nameplates not already provided shall be furnished and installed by the Contractor. Letter height shall be consistent with existing labeling, but shall not be less than 3 mm minimum.

All electrical equipment, including TOS enclosures, transformers, electrical panels, panel boards, motors, motor starters, pushbutton stations, selector switches, terminal boxes, and the like shall be identified using engraved laminated plastic nameplates with white surface and black core letters, attached with threaded fasteners. The inscription shall be as shown on the plan sheets or shall be approved by the Engineer.

A removable circuit directory shall be made for each lighting and distribution panel, and labeled with the function of each circuit on the panel. All directories shall be of a non-corrodible material.

### **EXPOSED CONDUITS**

All conduits shall be labeled as shown on the plan sheets and the conduit schedules. The conduits shall be tagged at both ends with 50 mm round brass tags. The conduit numbers shall be stamped onto the tag. Letter height shall be 5 mm minimum, unless otherwise stated. The tags shall be strapped to the conduits with stainless steel wires or tie wraps inserted through holes, drilled through the tag.

### **UNDERGROUND CONDUITS**

All underground conduits shall be labeled as shown on the plan sheets and the circuit schedules. The conduit identifier shall be spray painted using alphabet and number stencils. The conduit identifier shall be painted on both conduit ends, above each conduit, on the interior wall of the manholes. Letter height shall be 50 mm minimum using black lettering on a white background.

### **10-3.19 STATE-FURNISHED 7 METER LIGHT POLE AND FIXTURE**

This work shall include installing, delivering, assembling, wiring, and inspecting State-furnished 7 meter light poles and fixtures and shall conform to the details shown on the plans and these special provisions.

Attention is directed to "State-Furnished Materials," of these special provisions regarding the 7 meter light poles and fixtures.

### **SUBMITTALS**

Prior to transporting the light poles and fixtures to the bridge site, the Contractor shall inspect the light poles and fixtures at the light pole and fixture storage location as specified in "State-Furnished Materials," of these special provisions.

The Contractor shall furnish the light poles and fixtures inspection report to the Engineer. The light pole and fixture inspection report shall include the condition of light poles and fixtures and any existing damages that may have occurred prior to the Contractor's delivery. If no damage is found, the Contractor shall include a statement in the light pole and fixture inspection report to state that the light poles and fixtures are in good condition and acceptable for delivery and installation.

Each light pole and fixture shall be handled and transported in a manner that assures protection during transportation, on-loading, and off-loading.

### **INSTALLATION**

The light poles and fixtures shall be installed according to the manufacturers' recommendations.

Damaged light pole and fixture during loading, shipping, and installation must be replaced by the Contractor at the Contractor's expense as specified in Section 6-1.02, "State-Furnished Materials," of the Standard Specifications. No extension of time or compensation will be made for replacement light pole and fixture.

### **PAYMENT**

Full compensation for installing State-furnished 7 meter lighting pole and fixtures including inspection, delivery, wiring and assembly of the bike path landing lighting poles and fixtures shall be considered as included in the contract lump sum price paid for electrical work involved in either: (1) YBI Transition Structures Roadway Westbound; (2) YBI Transition Structures Roadway and Girder Eastbound; or (3) YBI Electrical Utility Relocations, as listed in the Engineer's estimate and no separate payment will be made therefor.

### **10-3.20 STATE-FURNISHED 3.5 METER BIKE PATH BELVEDERE LIGHT POLE AND FIXTURE**

This work shall include installing, delivering, assembling, wiring, and inspecting State-furnished 3.5 meter meter light poles and fixtures and shall conform to the details shown on the plans and these special provisions.

Attention is directed to "State-Furnished Materials," of these special provisions regarding the 3.5 meter bike path Belvedere light poles and fixtures.

#### **SUBMITTALS**

Prior to transporting the light poles and fixtures to the bridge site, the Contractor shall inspect the light poles and fixtures at the light pole and fixture storage location as specified in "State-Furnished Materials," of these special provisions.

The Contractor shall furnish the light poles and fixtures inspection report to the Engineer. The light pole and fixture inspection report shall include the condition of light poles and fixtures and any existing damages that may have occurred prior to the Contractor's delivery. If no damage is found, the Contractor shall include a statement in the light pole and fixture inspection report to state that the light poles and fixtures are in good condition and acceptable for delivery and installation.

Each light pole and fixture shall be handled and transported in a manner that assures protection during transportation, on-loading, and off-loading.

#### **INSTALLATION**

The light poles and fixtures shall be installed according to the manufacturers' recommendations.

Damaged light pole and fixture during loading, shipping, and installation must be replaced by the Contractor at the Contractor's expense as specified in Section 6-1.02, "State-Furnished Materials," of the Standard Specifications. No extension of time or compensation will be made for replacement light pole and fixture.

#### **PAYMENT**

Full compensation for installing State-furnished 3.5 meter bike path Belvedere light pole and fixture including inspection, delivery, wiring, and assembly of the bike path landing lighting poles and fixtures shall be considered as included in the contract lump sum price paid for electrical work involved in YBI transition structures roadway and girder eastbound and no separate payment will be made therefor.

### **10-3.21 STATE-FURNISHED BIKEPATH LANDING LIGHT POLE AND FIXTURE**

This work shall include installing, delivering, wiring, assembling, and inspecting State-furnished bike path landing light poles and fixtures and shall conform to the details shown on the plans and these special provisions.

Attention is directed to "State-Furnished Materials," of these special provisions regarding bike path landing light poles and fixtures.

Attention is directed to "Miscellaneous Metal (Bridge)," of these special provisions, regarding the pedestals for bike path landing light poles and fixtures.

#### **SUBMITTALS**

Prior to transporting the light poles and fixtures to the bridge site, the Contractor shall inspect the light poles and fixtures at the light pole and fixture storage location as specified in "State-Furnished Materials," of these special provisions.

The Contractor shall furnish the light poles and fixtures inspection report to the Engineer. The light pole and fixture inspection report shall include the condition of light poles and fixtures and any existing damages that may have occurred prior to the Contractor's delivery. If no damage is found, the Contractor shall include a statement in the light pole and fixture inspection report to state that the light poles and fixtures are in good condition and acceptable for delivery and installation.

Each light pole and fixture shall be handled and transported in a manner that assures protection during transportation, on-loading, and off-loading.

#### **INSTALLATION**

The light poles and fixtures shall be installed according to the manufacturers' recommendations.

Damaged light pole and fixture during loading, shipping, and installation must be replaced by the Contractor at the Contractor's expense as specified in Section 6-1.02, "State-Furnished Materials," of the Standard Specifications. No extension of time or compensation will be made for replacement light pole and fixture.

## **PAYMENT**

Full compensation for installing State-furnished bike path landing light pole and fixture including inspection, delivery, and assembly of the bike path landing lighting poles and fixtures shall be considered as included in the contract lump sum price paid for YBI transition structures roadway and girder eastbound and no separate payment will be made therefor.

### **10-3.22 STATE-FURNISHED CONTROLLER ASSEMBLIES**

The Model 170 controller assemblies, excluding anchor bolts, will be State-furnished as provided under "Materials" of these special provisions.

The Contractor shall install the controller cabinet on existing service platform as shown on the plans, and shall make field wiring connections to the terminal blocks in the controller cabinet.

A listing of field conductor terminations, in each State-furnished controller cabinet, will be furnished free of charge to the Contractor at the site of the work.

State forces will maintain controller assemblies. The Contractor's responsibility for controller assemblies shall be limited to conforming to the provisions in Section 6-1.02, "State-Furnished Materials," of the Standard Specifications.

### **CONTROLLER ASSEMBLIES POWER STRIP**

The Contractor shall furnish and install one rack-mount surge power strip with a switch in each State-furnished Model 334 controller cabinet. The power strip shall be plugged into the non-GFCI duplex outlet normally labeled with "Controller Unit Recp." in the back of the power distribution assembly (PDA) unit. The power strip shall be mounted at the top of the standard EIA-310 rack cage and across the two vertical back rails with four stainless steel EIA mounting screws, two on each side. The power strip shall not hinder the accessibility to the back of all existing electrical equipment. All power cords for permanently field installed electrical equipment shall be plugged into the power strip.

The power strip, at a minimum, shall meet the following requirements:

1. A maximum rating of 15 A, 120 V(ac), 60 Hz.
2. The power strip shall have a surge protection with UL 1449 Clamping Level of 400 V, an IEEE Let-Through Voltage rating of less than 336 V, a single-pulse energy rating of 210 J and EMI/RFI noise protection rating of 40 dB.
3. The power strip shall be 46 mm (H) x 483 mm (W) x 70 mm (D) maximum and shall not weigh more than 2.0 kg.
4. The front plate of the power strip shall have four cut-off ANSI/EIA mounting screw holes, two on each side.
5. The power strip shall have six rear outlets with 38 mm minimum apart center to center. The power cord shall enter from the rear with a length of 2 meters minimum. The clearance between the power cord entrance and the nearest outlet shall be 90-mm minimum.
6. It shall have a 15 A circuit breaker and an internally illuminated switch to cut off power to all outlets. Both the circuit breaker and the switch shall be front mounted.

### **10-3.23 TRAFFIC OPERATIONS SYSTEM**

The traffic operations system shall include the installation of advance warning sign, State-furnished Model 170 controller assembly for the ramp meter system preformed loop detector stations, fiber optic system, as shown on the plans and in conformance with these special provisions.

### **10-3.24 FIBER OPTIC SYSTEM**

Fiber optic system shall include installing of fiber optic cables, fiber splice closure, fiber distribution units, fiber optic data modems, fiber optic transmitters and receivers and any other associate equipment as shown on the plans and as specified in these special provisions.

### **FIBER OPTIC GLOSSARY**

**Breakout.**--The cable "breakout" is produced by (1) removing the jacket just beyond the last tie-wrap point, (2) exposing 900 mm to 1800 mm of the cable buffers, aramid strength yarn and central fiberglass strength member, and (3) cutting aramid yarn, central strength member and the buffer tubes to expose the individual glass fibers for splicing or connection to the appropriate device.

**Connector.**--A mechanical device used to align and join two fibers together to provide a means for attaching to and decoupling from a transmitter, receiver, or another fiber (i.e., patch panel).

**Connectorized.**--The termination point of a fiber after connectors have been affixed.

**Connector Module Housing (CMH).**--A patch panel used in the FDU to terminate singlemode fibers with most common connector types. It may include a jumper storage shelf and a hinged door.

**Couplers.**--Couplers are devices which mate two fiber optic connectors to facilitate the transition of optical light signals from one connector into another. They are normally located within FDUs mounted in panels. They may also be used unmounted, to join two simplex fiber runs.

**End-to-End Loss.**--The maximum permissible end-to-end system attenuation is the total loss in a given link. This loss could be the actual measured loss, or calculated using typical (or specified) values. A designer should use typical values to calculate the end-to-end loss for a proposed link. This number will determine the amount of optical power (in dB) needed to meet the System Performance Margin.

**Fan Out Termination.**--Permits the branching of fibers contained in an optical cable into individual cables and can be done at field locations; thus, allowing the cables to be connectorized or terminated per system requirements. A kit provides pull-out protection for individual bare fibers to support termination. It provides three layers of protection consisting of a Teflon inner tube, a dielectric strength member, and an outer protective PVC jacket. Fan out terminations shall be used in conjunction with patch panel for more than 6 fibers.

**FBC.**--Fiber Backbone Cable.

**Fiber Distribution Unit (FDU).**--A rack mountable enclosure containing both a Connector Module Housing (CMH) and a Splice Module Housing (SMH).

**Fiber Storage Enclosure (FSE).**--Designed for holding excess cable slack for protection. The FSE allows the user flexibility in equipment location and the ability to pull cable back for resplicing.

**F/O.**--Fiber optic.

**FOIP.**--Fiber optic inside plant cable.

**FOOP.**--Fiber optic outside plant cable.

**FOTP.**--Fiber optic test procedure(s) as defined by EIA/TIA standards.

**FPC.**--Fiber Pigtail Cable

**FTC.**--Fiber Trunkline Cable

**Light Source.**--A portable fiber optic test equipment that, in conjunction with a power meter, is used to perform end-to-end attenuation testing. It contains a stabilized light source operating at the designed wavelength of the system under test. It also couples light from the source into the fiber to be received at the far end by the receiver.

**Link.**--A passive section of the system, the ends of which are connectorized. A link may include splices and couplers. For example, a video data link may be from video F/O transmitter to video F/O receiver.

**Link Loss Budget.**--A calculation of the overall permissible attenuation from the fiber optic transmitter (source) to the fiber optic receiver (detector).

**Loose Tube Cable.**--Type of cable construction in which fibers are placed in buffer tubes to isolate them from outside forces (stress). A flooding compound or material is applied to the interstitial cable core to prevent water migration and penetration. This type of cable is primarily for outdoor applications.

**Mid-span Access Method.**--Description of a procedure in which fibers from a single buffer tube are accessed and spliced to an adjoining cable without cutting the unused fibers in the buffer tube, or disturbing the remaining buffer tubes in the cable.

**OFNR.**--Optic Fiber Non-conductive Riser.

**Optical Time Domain Reflectometer (OTDR).**--A fiber optic test equipment (similar in appearance to an oscilloscope) that is used to measure the total amount of power loss between two points and over the corresponding distance. It provides a visual and printed display of the relative location of system components such as fiber sections, splices and connectors as well as the losses that are attributed to each component and defects in the fiber, splices and connectors.

**Patch cord.**--A short jumper used to join two Connector Module Housing (CMH) couplers, and or a CMH and an active optical electronic device.

**Pigtail.**--Relatively short length of fiber optic cable that is connectorized on only one end. All pigtails shall be tight buffer cable.

**Power Meter.**--A portable fiber optic test equipment that, when coupled with a light source, is used to perform end-to-end attenuation testing. It contains a detector that is sensitive to light at the designed wavelength of the system under test. Its display indicates the amount of power injected by the light source that arrives at the receiving end of the link.

**Segment.**--A section of fiber optic cable that is not connected to any active device and may or may not have splices per the design.

**SMFO.**--Singlemode Fiber Optic Cable.

**Splice.**--The permanent joining of fiber ends to identical or similar fibers.



**Splice Enclosure.**--An environmentally sealed container used to organize and protect splice trays. The container allows splitting or routing of fiber cables from and to multiple locations.

**Splice Module Housing (SMH).**--Stores splice trays as well as pigtails and short cable lengths.

**Splice Tray.**--A container used to organize and protect spliced fibers.

**Splice Vault.**--An underground container used to house excess cable and splice enclosures.

**System Performance Margin.**--A calculation of the overall "End to End" permissible attenuation from the fiber optic transmitter (source) to the fiber optic receiver (detector). The system performance margin should be at least 6 dB. This includes the difference between the active component link loss budget, the passive cable attenuation (total fiber loss) and the total connector/splice loss.

**Tight Buffer Cable.**--Type of non-breakout cable construction where each glass fiber is tightly buffered (directly coated) with a protective thermoplastic coating to 900  $\mu\text{m}$  with the exception of the protective thermoplastic coating. The tight buffer cable shall meet all the characteristics of the fiber in the fiber optic outside plant cable specified in these specifications.

## FIBER OPTIC CABLE

**GENERAL.**--Each fiber optic cable for this project shall be all dielectric, gel filled or filled with water blocking material, duct type, with loose buffer tubes construction with a maximum outside diameter of 14 mm and shall conform to these special provisions. Cables shall contain singlemode (SM) dual-window (1310 nm and 1550 nm) fibers with the numbers specified below and as shown on the plans:

Type A	Fiber trunk line cable (FTC)	72 SM fibers
Type B	Fiber pigtail cable (FPC)	12 SM fibers

The optical fibers shall be contained within loose buffer tubes. The loose buffer tubes shall be stranded around an all dielectric central member. Aramid yarn shall be used as a primary strength member, and a polyethylene outside jacket shall provide for overall protection.

All F/O cable of each specific type shall be from the same manufacturer, who is regularly engaged in the production of this material.

The cable shall be qualified as compliant with RUS Federal Rule 7CFR1755.900.

**FIBER CHARACTERISTICS.**--Each optical fiber shall be made of glass and consists of a doped silica core surrounded by concentric silica cladding. All fibers in the buffer tube shall be usable fibers, and shall be sufficiently free of surface imperfections and inclusions to meet the optical, mechanical, and environmental requirements of these specifications. The required fiber grade shall reflect the maximum individual fiber attenuation, to guarantee the required performance of each and every fiber in the cable.

The coating shall be a dual layered, UV cured acrylate and shall be mechanically strippable without damaging the fiber.

The cable shall comply with the optical and mechanical requirements over an operating temperature range from -40 to +70 °C. The cable shall be tested in accordance with ANSI/EIA-455-3A (FOTP-3), "Procedure to Measure Temperature Cycling Effects on Optical Fiber, Optical Cable, and Other Passive Fiber Optic Components." The change in attenuation at extreme operational temperatures (from -40 to +70 °C) for singlemode fiber shall not be greater than 0.20 dB/km, with 80 percent of the measured values no greater than 0.10 dB/km. The singlemode fiber measurement is made at 1550 nm.

For all fibers the attenuation specification shall be a maximum attenuation for each fiber over the entire operating temperature range of the cable.

Singlemode fibers within the finished cable shall meet the requirements in the following table:

Parameters	Characteristic
Type	Step Index
Core diameter	8.3 $\mu\text{m}$ (nominal)
Cladding diameter	125 $\mu\text{m} \pm 1.0 \mu\text{m}$
Core to Cladding Offset	$\leq 1.0 \mu\text{m}$
Coating Diameter	250 $\mu\text{m} \pm 15 \mu\text{m}$
Cladding Non-circularity defined as: $[1 - (\text{min. cladding Dia} \div \text{max. cladding dia.})] \times 100$	$\leq 2.0$ percent
Proof/Tensile Test	345 MPa, min.
Attenuation: At 1310 nm At 1550 nm	$\leq 0.4$ dB/km $\leq 0.4$ dB/km
Attenuation at the Water Peak	$\leq 2.1$ dB/km at $1383 \pm 3$ nm
Bandwidth: At 850 nm At 1310 nm (SM)	N/A N/A
Chromatic Dispersion: Zero Dispersion Wavelength Zero Dispersion Slope	From 1301.5 to 1321.5 nm $\leq 0.092$ ps/(nm <sup>2</sup> *km)
Maximum Dispersion:	$\leq 3.3$ ps/(nm*km) for 1285 - 1330 nm <18 ps/(nm*km) for 1550 nm
Cut-Off Wavelength	<1250 nm
Mode Field Diameter (Petermann II)	9.3 $\pm 0.5 \mu\text{m}$ at 1300 nm 10.5 $\pm 1.0 \mu\text{m}$ at 1550 nm

**COLOR CODING.**--In buffer tubes containing multiple fibers, each fiber shall be distinguishable from others in the same tube by means of color coding according to the following:

1. Blue (BL)	7. Red (RD)
2. Orange (OR)	8. Black (BK)
3. Green (GR)	9. Yellow (YL)
4. Brown (BR)	10. Violet (VL)
5. Slate (SL)	11. Rose (RS)
6. White (WT)	12. Aqua (AQ)

Buffer tubes containing fibers shall also be color coded with distinct and recognizable colors according to the following:

1. Blue (BL)
2. Orange (OR)
3. Green (GR)
4. Brown (BR)
5. Slate (SL)
6. White (WT)
7. Red (RD)
8. Black (BK)

The colors shall be targeted in accordance with the Munsell color shades and shall meet EIA/TIA-598 "Color Coding of Fiber Optic Cables."

The color formulation shall be compatible with the fiber coating and the buffer tube filling compound, and be heat stable. It shall not fade or smear or be susceptible to migration and it shall not affect the transmission characteristics of the optical fibers and shall not cause fibers to stick together.

#### General

The fiber optic cable samples of 10 feet length with part numbers, original catalogue and documents from manufactures shall be submitted to the Engineer.

**CABLE CONSTRUCTION.**--The fiber optic cable shall consist of, but not be limited to, the following components:

1. Buffer tubes
2. Central member
3. Filler rods
4. Stranding
5. Core and cable flooding
6. Tensile strength member
7. Ripcord
8. Outer jacket

**Buffer tubes.**--Clearance shall be provided in the loose buffer tubes between the fibers and the inside of the tube to allow for expansion without constraining the fiber. The fibers shall be loose or suspended within the tubes. The fibers shall not adhere to the inside of the buffer tube. Each buffer tube shall contain up to 12 fibers.

The loose buffer tubes shall be extruded from a material having a coefficient of friction sufficiently low to allow free movement of the fibers. The material shall be tough and abrasion resistant to provide mechanical and environmental protection of the fibers, yet designed to permit safe intentional "scoring" and breakout, without damaging or degrading the internal fibers.

Buffer tube shall contain a water-swallowable yarn or a homogeneous hydrocarbon-based gel with anti-oxidant additives for water migration resistance. The filling compound shall be non-toxic and dermatologically safe to exposed skin. It shall be chemically and mechanically compatible with all cable components, non-nutritive to fungus, non-hygroscopic and electrically non-conductive. The filling compound shall be free from dirt and foreign matter and shall be readily removable with conventional nontoxic solvents.

Buffer tubes shall be stranded around a central member by a method that will prevent stress on the fibers when the cable jacket is placed under strain, such as the reverse oscillation stranding process.

Each buffer tube shall be distinguishable from other buffer tubes in the cable by the color coding specified for the fibers

**Central Member.**--The central member which functions as an anti-buckling element shall be a glass reinforced plastic rod with similar expansion and contraction characteristics as the optical fibers and buffer tubes. A linear overcoat of Low Density Polyethylene shall be applied to the central member to achieve the optimum diameter to provide the proper spacing between buffer tubes during stranding.

**Filler rods.**--Filler rods may be included in the cable to maintain the symmetry of the cable cross-section. Filler rods shall be solid medium or high density polyethylene. The diameter of filler rods shall be the same as the outer diameter of the buffer tubes.

**Stranding.**--Completed buffer tubes shall be stranded around the overcoated central member using stranding methods, lay lengths and positioning such that the cable shall meet mechanical, environmental and performance specifications. A polyester binding shall be applied over the stranded buffer tubes to hold them in place. Binders shall be applied using tension sufficient to secure the buffer tubes to the central member without crushing the buffer tubes. The binders shall be non-hygroscopic, non-wicking (or rendered so by the flooding compound), and dielectric with low shrinkage.

**Core and Cable Flooding.**--The cable core interstices shall be filled with a polyolefin based compound to prevent water ingress and migration. The flooding compound shall be homogeneous, non-hygroscopic, electrically non-conductive, and non-nutritive to fungus. The compound shall also be nontoxic, dermatologically safe and compatible with all other cable components.

**Tensile Strength Member.**--Tensile strength shall be provided by high tensile strength aramid yarns or fiberglass which shall be helically stranded evenly around the cable core and shall not adhere to other cable components.

**Ripcord.**--The cable shall contain at least one ripcord under the jacket for easy sheath removal.

**Outer jacket.**--The jacket shall be free of holes, splits, and blisters and shall be medium or high density polyethylene (PE), or medium density cross-linked polyethylene with minimum nominal jacket thickness of 1 mm.

Jacketing material shall be applied directly over the tensile strength members and flooding compound and shall not adhere to the aramid strength material. The polyethylene shall contain carbon black to provide ultraviolet light protection and shall not promote the growth of fungus.

The jacket or sheath shall be marked with the manufacturer's name, the words "Optical Cable", the number of fibers, "SM", year of manufacture, and sequential measurement markings every meter. The actual length of the cable shall be within one percent of the length marking. The marking shall be in a contrasting color to the cable jacket. The height of the marking shall be approximately 2.5 mm.

#### **GENERAL PERFORMANCE SPECIFICATIONS FOR FIBER OPTIC CABLE**

The F/O cable shall withstand water penetration when tested with a 900 mm static head or equivalent continuous pressure applied at one end of a 900 mm length of filled cable for one hour. No water shall leak through the open cable end. Testing shall be done in accordance with ANSI/EIA-455-82 (FOTP-82), "Fluid Penetration Test for Fluid-Blocked Fiber Optic Cable."

A representative sample of cable shall be tested in accordance with ANSI/EIA-455-81A, "Compound Flow (Drip) Test for Filled Fiber Optic Cable." The test sample shall be prepared in accordance with Method A. The cable shall exhibit no flow (drip or leak) at 80 °C as defined in the test method.

Crush resistance of the finished F/O cables shall be 2050 kg/m applied uniformly over the length of the cable without showing evidence of cracking or splitting when tested in accordance with ANSI/EIA-455-41 (FOTP-41) "Compressive Loading Resistance of Fiber Optic Cables." The average increase in attenuation for the fibers shall be  $\leq 0.10$  dB at 1550 nm for a cable subjected to this load. The cable shall not exhibit any measurable increase in attenuation after removal of load. Testing shall be in accordance with ANSI/EIA-455-41 (FOTP-41), except that the load shall be applied at the rate from 3 to 19 mm per minute and maintained for 10 minutes.

The cable shall withstand 25 cycles of mechanical flexing at a rate of  $30 \pm 1$  cycles/minute. The average increase in attenuation for the fibers shall be  $\leq 0.20$  dB at 1550 nm at the completion of the test. Outer cable jacket cracking or splitting observed under 10x magnification shall constitute failure. The test shall be conducted in accordance with ANSI/EIA-455-104 (FOTP-104), "Fiber Optic Cable Cyclic Flexing Test," with the sheave diameter a maximum of 20 times the outside diameter of the cable. The cable shall be tested in accordance with Test Conditions I and II of (FOTP-104).

Impact testing shall be conducted in accordance with ANSI/EIA-455-25 (FOTP-25) "Impact Testing of Fiber Optic Cables and Cable Assemblies." The cable shall withstand 20 impact cycles. The average increase in attenuation for the fibers shall be  $\leq 0.20$  dB at 1550 nm. The cable jacket shall not exhibit evidence of cracking or splitting.

#### **PACKAGING AND SHIPPING REQUIREMENTS**

The first order of work shall be to place the order for the electrical equipment. The Engineer shall be furnished a statement from the vendor that the order for the electrical equipment has been received and accepted by the vendor.

Attention is directed to "Fiber Optic Testing," in these special provisions.

The completed cable shall be packaged for shipment on reels. The cable shall be wrapped in a weather and temperature resistant covering. Both ends of the cable shall be sealed to prevent the ingress of moisture.

Each end of the cable shall be securely fastened to the reel to prevent the cable from coming loose during transit. Two meters of cable length on each end of the cable shall be accessible for testing.

Each cable reel shall have a durable weatherproof label or tag showing the manufacturer's name, the cable type, the actual length of cable (in meters) on the reel, the Contractor's name, the contract number, and the reel number. A shipping record shall be provided to the Engineer in a weatherproof envelope showing the above information and also include the date of manufacture, cable characteristics (size, attenuation, bandwidth, etc.), factory test results, cable identification number and any other pertinent information.

The cost of any damaged or broken optical fiber cable shall be borne by the Contractor.

The minimum hub diameter of the reel shall be at least thirty times the diameter of the cable. The F/O cable shall be in one continuous length per reel with no factory splices in the fiber. Each reel shall be marked to indicate the direction the reel should be rolled to prevent loosening of the cable.

Installation procedures and technical support information shall be furnished at the time of delivery.

#### **FIBER CABLE INSTALLATION**

Fiber optic cable shall be installed in conduit system or cable tray system as show on the plans. Fiber optic conduit system shall consist of conduits, fiber optic pull boxes and fiber optic splice vaults or cabinets.

Installation procedures shall be in conformance with the procedures specified by the cable manufacturer for the specific cable being installed. The Contractor shall submit to the engineer the manufacturer's recommended

procedures for pulling fiber optic cable at least 20 working days prior to installing cable. Mechanical aids may be used, provided that a tension measuring device is placed in tension to the end of the cable. The tension applied shall not exceed 2.2 kilonewtons or the manufacturers recommended pulling tension, whichever is less.

The F/O cable shall be installed using a cable pulling lubricant recommended by the cable manufacture and a non-abrasive pull rope conforming to the provisions described under "Conduit" Section 86-2.05C of Standard Specifications. The Contractor's personnel shall be stationed at each pull box, vault and cabinet through which the cable is pulled to lubricate and prevent kinking or other damage.

During cable installation, the bend radius shall be maintained at not less than twenty times the outside diameter of the cable. The cable grips for installing the fiber optic cable shall have a ball bearing swivel to prevent the cable from twisting during installation. The final installed bend radius of the fiber optic cable shall be no less than ten times the outside diameter of the cable.

### **Air Blown Installation**

At the Contractor's option, the fiber cable may be installed using compressed air to blow the FO cable into the conduit run. If integral innerduct is used, the duct splice points or any temporary splices of innerduct used for installation must withstand a static air pressure of 758 kPa.

The fiber installation equipment must incorporate a mechanical drive unit or pusher, which feeds cable into the pressurized innerduct to provide a sufficient push force on the cable, which is coupled with the drag force created by the high-speed airflow. The unit must be equipped with controls to regulate the flow rate of compressed air entering the duct and any hydraulic or pneumatic pressure applied to the cable. It must accommodate longitudinally ribbed or smooth wall ducts nominal from 16 mm to 51 mm inner diameter. Mid assist or cascading of equipment must be for the installation of long cable runs. The equipment must incorporate safety shutoff valves to disable the system in the event of sudden changes in pneumatic or hydraulic pressure.

The equipment must not require the use of a piston or any other air capturing device to impose a pulling force at the front end of the cable, which also significantly restricts the free flow of air through the inner duct. It must incorporate the use of a counting device to determine the speed of the cable during installation and the length of the cable installed.

### **Splices During Installation**

The cable shall be installed without splices except where specifically allowed on the plans or specified in these special provisions. Minimum slack of the cable as shown on the plans shall be provided at each cable access location without a cable splice. At fiber optic splice location, a minimum of 9 meters slack of each cable shall be stored in the splice location.

### **COLORED CONCRETE BACKFILL**

The concrete backfill for the installation of fiber optic conduits in trench shall be a medium to dark, red color to clearly distinguish the concrete backfill from other concrete and soil. The concrete shall be pigmented by the addition of commercial quality cement pigment to the concrete mix. The red concrete pigment shall be a product from LM Scofield Company; Orange Chromix Colorant; Davis Colors; or equal. The concrete shall conform to the provisions in Section 90-10; "Minor Concrete," of the Standard Specifications. The size of the aggregate shall not be larger than 9.0 mm.

For trenches in pavement areas, only the top 100 mm of concrete backfill will be required to be pigmented concrete. At the option of the Contractor, the full depth may have the pigment.

### **FIBER OPTIC PULL BOX**

Each fiber optic pull box shall conform to Section 86-2.06, "Pull Boxes," of the Standard Specifications for No. 6 with extensions and as shown on the plans. Cover marking shall be "CALTRANS TOS COMMUNICATION" on the cover. Pull box cover and extensions may be constructed of reinforced portland cement concrete or of non-PCC material with concrete gray color.

Conduits shall enter the fiber optic pull box through the sidewall at not more than 150 mm from the bottom of the pull box. Conduits shall not enter through the bottom of the pull box. Conduits shall not protrude more than 50 mm inside the pull box and shall enter the pull box at about 20 degrees in both the vertical and horizontal directions. Watertight sealing plugs as specified in this special provisions are required around all conduits.

### **FIBER OPTIC VAULT**

Fiber optic vaults shall be 1.3 meter (L) x 0.86 meter (W) x 0.60 meter (D) nominal inside dimensions and shall conform to Section 86-2.06, "Pull Boxes," of the Standard Specifications. Covers shall be in one or two sections. Hold down bolts or cap screws and nuts shall be of brass, stainless steel or other non-corroding metal material. Each

cover portion shall have inset lifting pull slots. Cover marking shall be "CALTRANS TOS COMMUNICATION" on the cover. Vault, cover and extensions may be constructed of reinforced portland cement concrete or of non-PCC material with concrete gray color.

Non-PCC vaults and covers shall be of sufficient rigidity that when a 45 kg concentrated point force is applied perpendicularly to the midpoint of one of the long sides at the top while the opposite long side is supported by a rigid surface, it shall be possible to remove the cover without the use of tools. When a vertical force of 6.6 kN is applied, through a 12 mm x 76 mm x 150 mm steel plate, to a non-PCC cover in place on a splice vault, the cover shall not fail and shall not deflect more than 6 mm.

Fiber optic vaults shall be installed as detailed and as shown on the plans. All fiber optic vaults and covers shall have an AASHTO HS 20-44 rating. Fiber optic vaults shall be installed at grade. Metallic or non-metallic cable racks shall be installed on the interior of both long sides of the fiber optic vaults. The racks shall be capable of supporting a load of 37 kg, minimum, per rack arm. Racks shall be supplied in lengths appropriate to the box in which they will be placed. All metallic cable racks shall be fabricated from ASTM Designation: A36 steel plate and shall be hot-dip galvanized after fabrication. Steel plate, hardware and galvanizing shall be in accordance with the requirements of Section 75, "Miscellaneous Metal," of the Standard Specifications. Metallic cable racks shall be bonded and grounded.

Unless otherwise shown on the plans or as directed by the Engineer, vaults shall be located outside the pavement with the lid centerline 1.5 m from the edge of the pavement or back of the dike. Vaults may be moved farther from the roadway to accommodate buried objects, existing conduits, or similar items that prevent installation 1.5 m from the pavement, but no part of the vault, concrete encasement ring, or backfill material shall be less than 450 mm from the edge of the pavement or back of the dike, to allow for future electrical conduit installations between the vault and roadway. The top of the vault lid shall match the final grade within 25 mm  $\pm$  12 mm.

Some locations along the roadway may have existing conduits, pipes, or drains parallel to the roadway and next to the shoulder, which may make it impossible to route conduits to the vault. At other locations, buried objects, steep drop-offs, or other object may make installation of a vault outside the pavement impossible. At these locations or as directed by the engineer, vaults may be installed in the pavement of the shoulder or in the pavement of chain on/off areas. Vaults placed inside the pavement shall be installed with the centerline of the vault not more 1 meter from the edge of pavement or back of dike, and with the entire top of vault lid 25 mm  $\pm$  12 mm below the surface of the pavement, when all pavement work specified in the job is completed.

Vaults located at bridges where exposed conduit must be used, such as at undercrossings, shall be located as close as possible to the end of the structure unless otherwise specified on the plans. If not specified otherwise in the plans, the location of vaults at bridge structures shall be between the first and second guardrail posts. Unless otherwise directed by the engineer, the top of the vault lid at these locations shall be located entirely behind the guardrail and shall conform to the final grade of the surrounding fill at the vault location. No part of the vault or vault lid shall be exposed or extend past the edge of the hinge point for the bridge, or otherwise deform the earth fill at the vault location.

Conduits shall enter the fiber optic vault through the sidewall at not more than 150 mm from the bottom of the vault. Conduits shall not enter through the bottom of the vault. Conduits shall not protrude more than 50 mm inside the pull box and shall enter the vault at about 20 degrees in both the vertical and horizontal directions. Watertight sealing plugs as specified in this special provisions are required around all conduits.

### **CONDUIT SEALING PLUGS**

Except otherwise noted, all fiber optic conduits shall have their ends sealed with commercial preformed plugs which prevent the passage of gas, dust and water into these conduits and their included innerducts. Sealing plugs shall be installed within each splice vault, pull box, cabinet, or building.

Sealing plugs shall be removable and reusable. Plugs sealing conductors and cables shall be the split type that permits installation or removal without removing cables. Sealing plugs shall seal the conduit simultaneously with one self contained assembly having an adjustable resilient filler of neoprene or silicone rubber clamped between backing ends and compressed with stainless steel hardware.

To provide suitable sealing between future varying size cables and the plugs, split neoprene or silicone adapting sleeves, used singularly or in multiples, shall be inserted within the body of the plugs. Sealing plugs used to seal the fiber optic conduit shall be capable of withstanding a pressure of 34 kPa. A sealing plug that seals an empty conduit shall have an eye or other type of capturing device (on the side of the plug that enters the conduit) to attach onto the pull rope, so that the pull rope will be easily accessible when the plug is removed.

### **WARNING TAPE**

Warning tape must be furnished, installed and placed in the trench over new conduits to receive new fiber optic cable as shown on in the plans.

The warning tape must have:

Description	Parameters
Thickness	Not be less than 0.1 mm thick
Width	100 mm
Material	Orange color polyolefin film
Tensile strength (2800 psi)	Minimum of 19.3 MPa
Elongation	Minimum of 500 percent elongation before breakage
Printed Text height	25 mm black color
Message background color	Bright orange color background
Message statement	CAUTION: BURIED FIBER OPTIC CABLE - CALTRANS RADIO ROOM (510) 286-6359
Message spacing intervals	Approximately every 1 meter

The printed warning must not be removed by the normal handling and burial of the tape and must be rated to last the service life of the tape.

The construction of the warning tape must be such that it will not delaminate when it is wet. It must be resistant to insects, acid, alkaline and other corrosive elements in the soil.

Warning tape shall be manufactured by Condux International, Inc.; Allen System, Inc.; Reef Industries, Inc. or equal.

### **INNERDUCT**

Innerduct shall be installed wherever fiber optic (F/O) cable is installed in conduit. Four innerducts shall be installed in one each Size 4 inch conduit. Each fiber optic cable shall be installed in its own innerduct.

Copper cable shall not be mixed with F/O cable within the same innerduct.

Innerduct shall consist of an extruded flexible, tubing or fabric mesh pouch, smooth corrugated or ribbed high density polyethylene (HDPE) installed inside electrical conduit. The fiber optic cable shall be installed in the tubing. Innerduct within a conduit run shall be continuous without splices or joints.

Unless otherwise shown on the plans, innerduct for new conduit shall be nominal 1.0 inch inside diameter with wall thickness of 0.0906 inch  $\pm$  0.003 inch, and shall meet the following requirements:

1. Polyethylene for innerduct shall have a density of 59.6187 lb/ft<sup>3</sup>  $\pm$  0.3121 lb/in<sup>3</sup> (ASTM Designation: D 1505) and shall conform to the applicable requirements of ASTM Designation: D 3485, D 3035, D 2239, and D 2447, and the applicable requirements of NEMA TC7 and TC2. Tensile yield strength shall be 3300 psi minimum in accordance with the requirements in ASTM Designation: D 638.
2. The polyethylene forming each innerduct shall be color coded in accordance with the cable type that it contains as follows:
  - 2.1. Type A – black
  - 2.2. Type B – orange
  - 2.3. Type C – yellow
  - 2.4. Type D – blue

The innerducts shall be shipped on reels marked with the manufacturer, the contract number, and the size and length of the innerduct. The product on reels shall be covered with aluminized material to protect colors from UV deterioration during shipment and storage.

Installation procedures shall conform to the procedures specified by the innerduct manufacturer.

### **TRUNKLINE SPLICE CABINET**

The trunkline splice cabinet (TSC) shall be a Type P cabinet. The Contractor shall construct each TSC foundation as shown on Standard Plan ES-3C including furnishing and installing anchor bolts, shall install the cabinet on the foundation, shall furnish and install fiber optic splice closure, cable retainer and shall make all cable breakout and field splice connections in the cabinet as shown on plans.

### **CABLE SPLICING**

Field cable splices shall be done either in splice vaults manholes or in cabinets as shown on the plans. All splices in splice vaults shall be done in splice trays, housed in splice enclosures. All splices in cabinets shall be done in splice trays housed in FDU's.

Unless otherwise allowed, the cable splices shall be fusion type. The mean splice loss shall not exceed 0.07 dB per splice. The mean splice loss shall be obtained by measuring the loss through the splice in both directions and then averaging the resultant values.

The mid-span access method shall be used to access the individual fibers in a cable for splicing to another cable as shown on the plans. Cable manufacturers recommended procedures and approved tools shall be used when performing a mid-span access. Only the fibers to be spliced may be cut. All measures shall be taken to avoid damaging buffer tubes and individual fibers including those not being used in the mid-span access.

The mid-span access method shall also be used to access the individual fibers in the trunkline cable for splicing pigtail cable. The Contractor will be allowed to splice up to 5 fibers to repair any damage done during mid-span access splicing without penalty. For each additional splice the Contractor will be assessed \$300.00. Any single fiber may not have more than 3 unplanned splices. If the fiber needs to be spliced more than 3 times, the entire length of fiber optic cable must be replaced at the Contractor's expense.

The field splices shall connect the fibers of the two cable lengths together. These splices shall be placed in splice trays and these splice trays shall then be placed in the splice enclosure.

The termination splices shall connect the cable span ends with pigtails. The termination splices shall be placed in splice trays and the splice trays shall then be placed in the fiber distribution unit (FDU).

Splice trays must accommodate a minimum of 12 fusion splices. The individual fibers shall be looped at least one full turn within the splice tray to avoid micro bending. A 50 mm minimum bend radius shall be maintained during installation and after final assembly in the optical fiber splice tray. Each bare fiber shall be individually restrained in a splice tray. The optical fibers in buffer tubes and the placement of the bare optical fibers in the splice tray shall be such that there is no discernable tensile force on the optical fiber.

All splices shall be protected with a metal reinforced thermal shrink sleeve.

### **FIBER OPTIC SPLICE CLOSURE**

Fiber optic cable field splices shall be enclosed in splice closures which shall be waterproof, rodent proof and re-enterable. The fiber optic splice closure shall be suitable for a temperature range from 0 to 50 °C.

Manufacturer's installation instructions shall be supplied to the Engineer prior to the installation of any splice enclosures.

The splice closure shall consist of an outer closure, an inner closure and complete with splice organizer trays, brackets, plugs, clips, cable ties and sealants as needed and shall conform to the following:

1. Non-filled thermoplastic case.
2. Expandable from 2 cables per end to 8 cables per end by using adapter plates.
3. Cable entry ports shall accommodate 0.4 inch to one inch diameter cables.
4. Multiple grounding straps.
5. Accommodate up to 8 splice trays.
6. Suitable for "butt" cable entry configurations.
7. Place no stress on finished splices within the splice trays.

The size of the closure shall allow all the fibers of the largest fiber optic trunk cable or buffer tube to be spliced to a second cable or buffer tube of the same size, plus fibers from fiber optic pigtail cable. The closure shall be not more than 914 mm in length and not more than 200 mm in diameter.

All materials in the closures shall be nonreactive and shall not support galvanic cell action. The outer-closure shall be compatible with the other closure components, the inner closure, splice trays, and cables.

The end plate shall consist of two sections and shall have capacity for two fiber optic trunk cables and fiber optic branch cables.

The outer-closure shall protect the splices from mechanical damage, shall provide strain relief for the cable, and shall be resistant to salt corrosion.

The outer-closure shall be waterproof, re-enterable and shall be sealed with a gasket. The outer-closure shall be flash-tested at 103 kPa.

The inner-closure shall be of metallic construction. The inner-closure shall be compatible with the outer closure and the splice trays and shall allow access to and removal of individual splice trays. The splice trays shall be compatible with the inner closure and shall be constructed of rigid plastic or metal.

Adequate splice trays shall be provided to splice all fibers of the largest communication cable or buffer tube plus FPC.

Vinyl markers shall be used to identify each spliced fiber in the trays as specified under "Fiber Optic Cable Labeling" in these special provisions.

Each splice shall be individually mounted and mechanically protected in the splice tray.



The Contractor shall install the fiber splice enclosure in the manholes, or splice vaults as shown on the plans where splicing is required. The Contractor shall provide all mounting hardware required to securely mount the fiber optic splice enclosures to the splice vault or cabinet.

The fiber splice enclosure shall be mounted as shown on the plans in a manner that allows the cables to enter at the end of the enclosure. Not less than 9 meters of each cable (2 or 3) shall be coiled in the manhole or splice vault to allow the fiber splice enclosure to be removed for future splicing.

The unprotected fibers exposed for splicing within the enclosure shall be protected from mechanical damage using the fiber support tube or tubes and shall be secured within the fiber splice enclosure.

Upon completion of the splices, the splice trays shall be secured to the inner closure.

The closure shall be sealed using a procedure recommended by the manufacturer that will provide a waterproof environment for the splices. Encapsulant shall be injected between the inner and outer closures.

Care shall be taken at the cable entry points to ensure a tight salt resistant and waterproof seal is made which will not leak upon aging. It is not acceptable to have multiple cables enter the fiber splice closure through one hole.

## **FIBER OPTIC CABLE TERMINATIONS**

**Distribution Breakout.**--The jacketed cable shall be lashed with tie wraps to the rack prior to entering the FDU. The cable shall also be tie-wrapped to the inside of the FDU near the point of entry. The glass fibers shall not be damaged during cutting and removal of the buffer tubes.

The jacketed area and bare fibers shall be cleaned to remove the moisture blocking gel. The transition from the buffer tube to the bundle of jacketed fibers shall be treated by an accepted procedure for sleeve tubing, shrink tubing and silicone blocking of the transition to prevent future gel leak.

A subsequent transition shall be made, with flexible tubing, to isolate the fiber bundles of each buffer tube to serve as a transition from the bundle to the separation point and to protect the individual coated fibers. The last transition point (bundle to single fiber) shall consist of inserting the individual fibers into No. 26 AWG clear teflon tubing, to protect the fiber as it is routed toward the splice tray and to allow clear color identification of fibers for proper distribution. The final transition from bundle to individual fiber tube shall be secured with an adhesive heat shrink sleeve. The individual fibers shall then be stripped and prepared for splicing.

All fibers inside a fiber optic cable entering a FDU shall be properly terminated, whether they are used or not

**Distribution Interconnect Package.**--Distribution involves connecting the fibers to the active electronic components. The distribution equipment consists of FDUs with connector panels, couplers, splice trays, fiber optic pigtails and cable assemblies with connectors.

The distribution interconnect package shall be assembled and tested by a company who is regularly engaged in the assembly of these packages. Attention is directed to "Fiber Optic Testing" in these special provisions. All distribution components shall be products of the same manufacturers, who are regularly engaged in the production of these components, and the respective manufacturers shall have quality assurance programs.

## **FIBER OPTIC CABLE ASSEMBLIES AND PIGTAILS**

**General.**--Cable assemblies and pigtails shall be products of the same manufacturer. The cable used for cable assemblies and pigtails shall be made of fiber meeting the performance requirements of these special provisions for the F/O cable being connected.

**Pigtails.**--Pigtails shall be of simplex (one fiber) construction, in 900  $\mu$ m tight buffer form, surrounded by aramid for strength, with a PVC jacket with manufacturer identification information and a normal outer jacket with diameter of 3 mm. Singlemode cable jackets shall be yellow in color. All pigtails shall be factory terminated and tested and at least 900 mm in length.

**Patch cords.**—Patch cords may be of simplex or duplex design. Duplex jumpers shall be of duplex round cable construction, and shall not have zipcord (siamese) construction. The patch cord shall be terminated with ST compatible super physical contact singlemode connector at both ends. The fiber strands shall meet the specifications as those of the fiber cable and the connectors shall meet the specifications as specified in these special provisions. All patch cords shall be at least 2 meters in length, sufficient to avoid stress and orderly routing.

The outer jacket of duplex patch cords shall be colored yellow. The two inner simplex jackets shall be color coded white and slate, respectively, to provide easy visual identification for polarity.

**Connectors.**--Connectors shall be of the ceramic ferrule ST "push-pull" type. Indoor ST connector housings shall be either nickel plated zinc or glass reinforced polymer construction. Outdoor connector body housing shall be glass reinforced polymer.

The associated coupler shall be same material as the connector housing.

All F/O connectors shall be 2.5 mm ST connector ferrule type with Zirconia Ceramic material with a physical contact pre-radii used tip.

The ST connector operating temperature range shall be from -40 to +70 °C. Insertion loss shall not exceed 0.4 dB and the return reflection loss on singlemode connectors shall be at least 40 dB. Connection durability shall be less than 0.2 dB change per 500 mating cycles per ANSI/EIA-455-21A (FOTP-21).

All terminations shall provide a minimum 220 Newton pull out strength. Factory test results shall be documented and submitted to the Engineer prior to installing any of the connectors. Singlemode connectors shall have a yellow color on the body or the boot.

Field terminations shall be limited to splicing of adjoining cable ends or cables to ST pigtails.

**ST Couplers.**--The ST couplers shall be made of nickel plated zinc or glass reinforced polymer that is consistent with the material forming the associated ST connector body. The design mechanism for mounting the coupler to FDU connector module panel may be flanged or threaded but shall coincide with FDU panel punch-outs.

All coupler sleeves shall be ceramic of the split clamshell or clover leaf design.

The temperature range for the couplers shall be the same as that specified for the ST connectors.

## **FIBER OPTIC DISTRIBUTION UNIT**

Fiber distribution unit (FDU) shall be ANSI/EIA-310 standard mount type as shown on the plans.

FDU shall consist of a connector module housing (CMH) and a splice module housing (SMH). The CMH shall have sufficient number of connection panels to handle the associated fiber terminations. The SMH shall have the capacity to secure and store the required splice trays and break out cables.

Connector module housing (CMH) shall have a Lexan front cover so as not expose fiber optic connections. Each connection panel shall have six coupler capacity and all panel positions shall be filled with couplers. All spare couplers shall have dust covers on both sides. Each connection panel shall be secured to the CMH frame with two plastic punch snap fastener on each side of the panel.

Splice module housing (SMH) shall have sufficient number of splice trays to handle the transition splices between the field cables and their respective breakouts. Cable accesses to the SMH shall have grommets. SMH shall have a rear metal cover of the same gauge and color as the remainder of the FDU rack

The front and back covers of the FDU shall be retractable or removable to facilitate internal installation.

## **FIBER OPTIC LABELING**

### **General**

The Contractor shall label all fiber optic and copper communications cabling in a permanent consistent manner. All tags shall be of a material designed for long term permanent labeling of fiber optic and copper communications cables and shall be marked with permanent ink on non-metal types, or embossed lettering on metal tags. Metal tags shall be constructed of stainless steel. Non-metal label materials shall be approved by the Engineer. Labels shall be affixed to the cable per the manufacturer's recommendations and shall not be affixed in a manner which will cause damage to the fiber. Handwritten labels shall not be allowed.

### **Label Identification**

Labeling of the backbone, distribution and drop fiber optic cables shall conform to the following unique identification code elements:

No.	Description	Code	Number of Characteristics
1	Cable Type	Fiber: S: Singlemode	1
2	Fiber Count	Number of fibers or conductor pairs (example: 72 fibers)	3
3	Begin Function	T: TMC; H: Hub; V: Video Node; D: Data Node; C: Cable Node; TV: CCTV Camera; CM: CMS; E: Traffic Signal; RM: Ramp Meter; TM: Traffic Monitoring/Count Station/Vehicle Count Station (VDS, TMS); SV: Splice Vault SC: Splice Cabinet	1 or 2
4	County	County Number; Example: 033 (for Alameda)	3
5	Route Number	Hwy, Rte (example: 005)	3
6	Post Mile	Example: xxxxx	5
7	End Function	T: TMC; H: Hub; V: Video Node; D: Data Node; C: Cable Node; TV: CCTV Camera; CM: CMS; E: Traffic Signal; RM: Ramp Meter; TM: Traffic Monitoring/Count Station/Vehicle Count Station (VDS, TMS); SV: Splice Vault SC: Splice Cabinet	1 or 2
8	County	County Number; Example: 034 (for Sacramento)	3
9	Route Number	Hwy, Rte (example: 005)	3
10	Post Mile	Example: xxxxx	5
11	Unique ID	Identifies when two or more fiber cables are involved (example: xx)	2

Caltrans District 4 county system numbers are as following:

County	County System Number
Alameda	33
Contra Costa	28
Marin	27
Napa	21
San Francisco	34
San Mateo	35
Santa Clara	37
Santa Cruz	36
Sonoma	20
Solano	23

Example: S 048 SV 033 080 00569 SV 033 080 00610 03.

The label in the example can be translated as a singlemode (S) 48 strand cable (048) that starts from a splice vault (SV) in Alameda County (033) on I-80 (080) post mile 5.69 (00569) ends at another splice vault (SV) in Alameda County (033) on I-80 (080) at post mile 6.10 (00610). This fiber optic cable is uniquely identified as 03. This means the cable is the 3<sup>rd</sup> of the fiber optic cables in the pull box or the vault.

Each cable shall display a unique identification, regardless of where the cable is viewed. The begin function and end function correspond to the end points of each cable. The order of the begin and end function follow a hierarchy as listed below, where the lowest number corresponding to the begin/end function is listed first.

1	TMC
2	HUB
3	Video Node (VN)
4	Data Node (DN)
5	Cable Node
6	CCTV Camera
7	CMS
8	Traffic Signal
9	Ramp Meter
10	Traffic Monitoring Count Station
11	HAR
12	EMS
13	Weather Station
14	Weight In Motion
15	Splice Vault or Cabinet

This scheme will work as follows:

A cable between the TMC and a HUB will always have the TMC listed as the start function and the HUB as the end function. Between a CMS and a Splice Vault, the start function will always be listed as the CMS, and so on. If a cable is connected between HUBs, for example HUB-01 and HUB-03, the lowest number, in this case HUB-01, will be listed as the start function and HUB-03 as the end function.

At each FDU the Contractor shall provide a listing of the cable or cables terminated and where each fiber appears on the connector panel, a list of all jumpers and the equipment that they are connected to, and a geographical layout of all the equipment installed by the Contractor. In field cabinets these shall be placed in a waterproof pouch mounted on the cabinet door.

### Label Placement

Abbreviations:

TMC	Txxx.xx
HUB	Hxxx.xx
VAULT	SVxxx.xx
PULL BOX	PBxxx.xx
CAMERA	TVxxx.xx
CMS	CMxxx.xx
TMS	TMxxx.xx
RAMP METER	RMxxx.xx
TRAFFIC SIGNAL	Exxx.xx
HAR	HRxxx.xx
EMS	FMxxx.xx
WEATHER STATION	WSxxx.xx
WEIGHT IN MOTION	WTxxx.xx

The x's denote the post mile of the above elements.

**Cables.**--All cables shall be clearly labeled with the unique identification code element method specified in these special provisions, at all terminations, even if no connections or splices are made, and at all splice vault entrance and exit points.

**Cable to Cable Splices.**--All cable jackets entering the splice enclosure shall be labeled in accordance with the identification method specified in these special provisions.

**Cable to Fiber Distribution Units.**--The cable jackets shall be clearly labeled at entry to the FDU in accordance with the unique identification code element method specified in these special provisions. In addition, each fiber and pigtail shall be labeled at the connector with the Fiber ID. The FDU shall be clearly labeled with the Cable ID on the face of the FDU. If multiple cables are connected to the FDU, each block of connectors relating to each individual cable shall be clearly identified by a single label with the Cable ID. Individual connections shall be clearly marked on the face of the FDU in the designated area with the Fiber ID.

**Fiber.**--Fibers labels shall be placed next to the connectors of the individual fibers.

**Patch Panels.**--The cable jackets shall be clearly labeled at entry to the Patch Panel in accordance with the unique identification code element method described in these special provisions. In addition, each fiber and pigtail shall be labeled at the connector with the Fiber ID. The Patch panel shall be clearly labeled with the Cable ID on the face of the Panel. If multiple cables are connected to the Patch Panel, each block of connectors relating to each individual cable shall be clearly identified by a single label with the Cable ID. Individual connections shall be clearly marked on the face of the Panel in the designated area with the Fiber ID.

**Splice Trays.**--A label shall be placed on each splice tray explaining the splices in each tray.

### **FIBER OPTIC DATA MODEM**

The fiber optic data modem (FODM) shall be ANSI/EIA-232 compatible fiber optic modem with dual optics for drop/insert capability which can be configured as master or local(slave) in either daisy chain or fault tolerant dual redundant (counter rotating) ring network architecture. These four modes of operations shall be selectable via an external Mode DIP-switch. All signals received via an optical port and retransmitted via fiber or via an expansion port shall be retimed to 0.01 percent pulse width accuracy by a crystal controlled time base, eliminating pulse width distortion and eliminating virtually unlimited repeating. The FODMs shall have anti-streaming circuitry for both the optical fiber and the electrical (ANSI/EIA-232) sides. On ANSI/EIA-232 side, when enabled, the anti-streaming shall limit the amount of time an external device is allowed to transmit data onto the network for each Request to Send (poll). On the fiber side, the anti-streaming shall disable an optical receiver in the event that the receiver output stays high longer than maximum allowable time thus preventing the whole fiber network from being disabled by a continuous "on" failure by receiver or optical emitter. External (TIMEOUT) DIP-switch shall allow user to disable or select the timeouts for both the optical side anti-streaming feature and the ANSI/EIA-232 side anti-streaming feature as well as to enable or disable the "Fiber Activity CTS Disable" feature. LED indicators to display power "on", anti-streaming "Fault" time-out and ANSI/EIA-232 fiber optic activity (selectable via dual function switch).

The FODMs at the field element shall be stand-alone type and shall be securely fastened on a ANSI/EIA-310 rack-mount shelf. At the hub location, the FODMs shall be rack-mount type installed in card cage assembly. The card cage assembly shall be ANSI/EIA-310 rack mount type with at least 14 slots and with two power supplies for redundancy.

The FODM shall meet the following requirements:

Electrical Signaling:	ANSI/EIA-232 with full handshake control signals
Electrical Power:	115 V(ac), 60 Hz
Operating Temperature	From -40 to 70 °C
Operating Mode:	1. Daisy chain Master mode 2. Daisy chain Local mode 3. Fault tolerant Master mode 4. Fault tolerant Local mode
Emitter type:	Laser
Wavelength	1310 nm
Minimum coupled transmit power into: 9/125 $\mu$ m	-11 dBm at 25 °C, -9.5 dBm at 75 °C
Output Variation	-0.015 dB/°C
Minimum receiver input power for $10^{-9}$ BER	-40 dBm
Maximum receiver input	-11 dBm
Optical port type	ST
ANSI/EIA -232 connector type	DE9 female
Data Rates (auto)	From 1200 baud to 57.6 kbaud
Bit Error Rate:	$10^{-9}$
Link Budget(Range) via singlemode 1310 nm	31 dB for (56 km)

FODMs shall be tested as follows:

1. Each optical modem shall be functionally tested by looping back optical transmit connector to the optical receive connector using a variable optical attenuator with measured optical loss at 31 dB at 1310 nm. A test set shall be connected to the modem and set for ANSI/EIA-232 communication testing. Fifteen minutes BER test burn-in test shall be error free.
2. After performing the 15 minutes BER test, at least two modems shall be tested for receiver dynamic range. Use the following procedure:
  - 2.1. First, the optical attenuation shall be increased to the point at which the data test just begins to register bit errors and the optical receive power into the modem shall be measured and recorded.
  - 2.2. The optical attenuation shall be then decreased until data test once again register errors. At no time shall the optical power into the receiver exceed the manufacturer's specified saturation level.
  - 2.3. The optical receive levels shall once again be measured and recorded.

These minimum and maximum receiver power levels define modem receiver's dynamic range and shall meet or exceed the manufacturer's specifications.

3. One pair of modem shall be interconnected using optical patch cords and attenuators with a loss of 31 dB in each direction. The ANSI/EIA-232 interface shall be looped back onto one modem and a test set connected to the ANSI/EIA-232 interface of the other modem. A bit error rate of less than  $10^{-9}$  shall be demonstrated.

## FIBER OPTIC TESTING

Testing shall include the tests on elements of the passive fiber optic components: (1) at the factory, (2) after delivery to the project site but prior to installation, (3) after installation but prior to connection to any other portion of the system, and (4) during final system testing. The active components shall be tested after installation.

Documentation of all test results shall be provided to the Engineer within 5 working days after the test involved.

A minimum of 15 working days prior to arrival of the cable at the site, the Contractor shall provide detailed test procedures for all field testing for the Engineer's review and approval. The procedures shall include the tests involved and how the tests are to be conducted. Included in the test procedures shall be the model, manufacturer, configuration, date and operating procedures.

### Factory Testing

The Contractor must provide the original documentation from the manufacturer for the factory testing and of compliance with the fiber specifications as listed in the Fiber Characteristics Table. Before shipment, but while on the shipping reel, 100 percent of all fibers shall be tested for attenuation. Copies of the results shall be (1) maintained on file by the manufacturer with a file identification number for a minimum of seven years,

(2) attached to the cable reel in a waterproof pouch, and (3) submitted to the Contractor for providing the same to the Engineer.

#### **Arrival on Site**

The cable and reel shall be physically inspected on delivery and 100 percent of the fibers shall be attenuation tested to confirm that the cable meets requirements. Attenuation tests shall be performed with an OTDR capable of recording and displaying anomalies of 0.02 dB as a minimum. Singlemode fibers (SM) shall be tested at 1310 nm and at 1550 nm.

The Contractor shall provide all personnel, equipment, instrumentation and materials necessary to perform all testing at site. The Engineer shall be notified two working days prior to all field tests. The notification shall include the exact location or portion of the system to be tested.

Test results shall be recorded, dated, compared and filed with the copy accompanying the shipping reel in a weather proof envelope. Attenuation deviations from the shipping records greater than 5 percent shall be brought to the attention of the Engineer. The cable shall not be installed until completion of this test sequence and the Engineer provides written approval. Copies of traces and test results shall be submitted to the Engineer. If the test results are unsatisfactory, the reel of FO cable shall be considered unacceptable and all records corresponding to that reel of cable shall be marked accordingly. The unsatisfactory reels of cable shall be replaced with new reels of cable at the Contractor's expense. The new reels of cable shall then be tested to demonstrate acceptability. Copies of the test results shall be submitted to the Engineer.

#### **After Cable Installation**

After the fiber optic cable has been pulled but before breakout and termination, 100 percent of all the fibers shall be tested with an OTDR for attenuation. Test results shall be recorded, dated, compared and filed with the previous copies of these tests. Copies of traces and test results shall be submitted to the Engineer for approval. If the OTDR test results are unsatisfactory, the fiber optic cable segment will be unacceptable. The unsatisfactory segment of cable shall be replaced with a new segment, without additional splices, at the Contractor's expense. The new segment of cable shall then be tested to demonstrate acceptability. Copies of the test results shall be submitted to the Engineer.

Attenuation tests shall be performed with an OTDR capable of recording and displaying anomalies of 0.02 dB as a minimum. Singlemode fibers (SM) shall be tested at 1310 nm and at 1550 nm. Attenuation readings shall be recorded on a cable data sheet showing factory and after installation results.

The OTDR shall have a printer capable of producing a verifying test trace with fiber identification as shown in Appendix A "Link Loss Budget Work Sheet," numerical loss values, the date and the operator's name. The Contractor to submit test results to the Engineer in a minimum of 1 GB Secure Digital (SD) card or USB flash drive.

#### **Fiber Optic System Gain Margin**

The installed system gain margin shall be at least 6 dB for each and every link. If the design system gain margin is less than 6 dB, the Engineer shall be notified and informed of the Contractor's plan to meet that requirement. Test results shall be recorded and submitted to the Engineer for approval.

#### **Interconnecting Parts Testing and Documentation**

All the components of the passive interconnecting parts (FDUs, pigtails, couplers and splice trays) shall be from a manufacturer who is regularly engaged in the production of the fiber optic components described.

Each ST termination shall be tested for insertion attenuation loss with the use of an optical power meter and source. In addition, all singlemode terminations shall be tested for return reflection loss. These values shall meet the loss requirements specified earlier and shall be recorded on a tag attached to the pigtail or jumper.

Once interconnecting assembly is complete, the Contractor shall visually verify that all tagging, including loss values, is complete. Then as a final quality control measure, the Contractor shall do an "end to end" optical power meter/light source test from pigtail end to jumper lead end to assure continuity and overall attenuation loss values.

The final test results shall be recorded, along with previous individual component values, on a special form assigned to each FDU. The completed form shall be dated and signed by the contractor's supervisor. One copy of this form will be attached in a plastic envelope to the assembled FDU unit. Copies will be provided separately to the Contractor and to the Engineer.

#### **Active Component Testing**

The transmitters and receivers shall be tested with a power meter and light source, to record the transmitter average output power in (dBm) and receiver sensitivity in (dBm). These values shall be recorded in the "Link Loss Budget Work Sheet" shown in Appendix A.

### **System Verification at Completion**

Once the passive cabling system has been installed and is ready for activation, 100 percent of the fiber links shall be tested with the OTDR for attenuation at both wavelengths. Test results shall be recorded, dated, compared and filed with previous copies. A hard copy printout and a electronic copy of the traces and test results along with a licensed copy of the associated software on a minimum 4 GB USB version 2.0 flash drive or a Secure Digital card shall be submitted to the Engineer. If the OTDR test results are unsatisfactory the link shall be replaced at the Contractor's expense. The new link shall then be tested to demonstrate acceptability. Copies of the test results shall be submitted to the Engineer.

The "Link Loss Budget Work Sheet" shown in Appendix A shall be completed for each link in the fiber optic system, using the data gathered throughout the installation process. The completed work sheets shall be included as part of the system documentation in the As-Built Plans.

The "Total System Gain" shall be calculated by subtracting the measured "Optical Receiver Sensitivity" (line 1B on the "Link Loss Budget Work Sheet") from the measured "Optical Transmitter Average Power" (line 1A), which were obtained using a power meter and source. The resulting difference shall be the maximum allowable loss between the transmitter and the receiver, within 0 percent to +10 percent of the manufacturers specified loss budget for the transmitter/receiver pair. The "Total System Gain" shall be recorded on line 1C.

The "Fiber Losses" for a link shall be calculated by multiplying the length of the fiber link (line 2A) by the normalized cable attenuation (dB/km, line 2B) at the operating wavelength. The normalized attenuation for this calculation shall be the maximum value throughout the operating temperature range of the cable. The product shall be recorded on line 2C.

The total connector losses shall be calculated by summing the individual attenuation values for each connector pair in the link, excluding the transmitter and receiver connectors. The sum shall be recorded on line 2D.

The total splice losses shall be calculated by summing the individual attenuation values for each splice in the link. The sum shall be recorded on line 2E.

The total of other losses shall be calculated by summing the individual attenuation values for each component in the link not previously addressed. The sum shall be recorded on line 2F. These items may include, but are not limited to, couplers, splitters, routers and switches.

The "Total System Loss" shall be recorded on line 2G of the "Link Loss Budget Work Sheet."

The "Design System Gain Margin" shall be calculated by subtracting the Total System Loss (line 2G) from the Total System Gain (line 1C). The resulting difference shall be recorded on line 3A. The Contractor's attention is directed to "F/O System Gain Margin," in these special provisions.

At the conclusion of the final OTDR testing, 100 percent of all fiber links shall be tested end to end with a power meter and light source, in accordance with ANSI/EIA Optical Test Procedure 171 and in the same wavelengths specified for the OTDR tests. These tests shall be conducted in both directions. Test results shall be recorded, compared and proven to be within the design link loss budgets, and filed with the other recordings of the same links. Test results shall be submitted to the Engineer.

If during any of these system verification tests, the results prove to be unsatisfactory, the F/O cable will not be accepted. The unsatisfactory segments of cable shall be replaced with a new segment of cable at the Contractor's expense. The new segment of cable shall undergo the same testing procedure to determine acceptability. Copies of the test results shall be submitted to the Engineer. The removal and replacement of a segment of cable shall be interpreted as the removal and replacement of a single contiguous length of cable connecting two splices, two connectors, or a splice and a connector.



## APPENDIX A

### Link Loss Budget Worksheet

Contract No. \_\_\_\_\_

Contractor: \_\_\_\_\_

Approved by Caltrans: \_\_\_\_\_

Date: \_\_\_\_\_

Operator: \_\_\_\_\_

Link Number: \_\_\_\_\_

Fiber Color: \_\_\_\_\_

Buffer Color: \_\_\_\_\_

Cable No. : \_\_\_\_\_

Test Wavelength (Circle one):    1310 nm        1550 nm

#### Section 1:    Total System Gain

Measured Optical Transmitter Average Power: \_\_\_\_\_ dBm        1A

Measured Optical Receiver Sensitivity  
(this should be a negative value): \_\_\_\_\_ dBm        1B

Subtract line 1B from 1A to obtain Total System Gain:  
\_\_\_\_\_ dB        1C

#### Section 2: Total System Loss

Measured length of the link: \_\_\_\_\_ km        2A

Measured loss per km of the fiber: \_\_\_\_\_ dB/km        2B

Multiply line 2A by 2B to obtain the Total Fiber Loss: \_\_\_\_\_ dB        2C

Sum of all Connector Losses in the link: \_\_\_\_\_ dB        2D

Sum of all Splice Losses in the link: \_\_\_\_\_ dB        2E

Sum of all Other Losses from other components    (couplers,  
splitters, routers, switches, etc.) \_\_\_\_\_ dB        2F

Add lines 2C, 2D, 2E and 2F to obtain Total System Loss: \_\_\_\_\_ dB        2G

#### Section 3: Design System Gain Margin

Subtract line 2G from line 1C

(This number must be at least 6 dB): \_\_\_\_\_ dB        3A

### **10-3.25 CIRCUIT BREAKER TYPE B**

Install this circuit breaker as part of the YBI Electrical Utility Relocations plans only

The circuit breaker Type B shall be a molded case circuit breaker providing complete circuit overcurrent protection by having inverse time and instantaneous tripping characteristics and shall be designed, manufactured, assembled and tested in accordance with UL 489 and NEMA AB-1 Standards. The frame rating and settings shall be as specified on the plans.

The molded case circuit breakers shall be operated by a toggle-type handle and shall have a quick-make, quick-break over-center switching mechanism that is mechanically trip free from the toggle handle so that the contacts cannot be held closed against short circuits and abnormal currents. All poles shall be so constructed that contacts open, close and trip simultaneously in the either ON or OFF position. All breaker covers shall have molded-in "ON" and "OFF" position.

The circuit breaker frames shall employ high strength, molded-polyester, glass-reinforced cases and covers. The breaker frame shall have legible, tamper-proof nameplates containing maximum frame ampere ratings, maximum voltage ratings and interrupting ratings in accordance with UL standards. All breaker frames sizes shall have external means for manually tripping the breaker and exercising the mechanism and trip latch member.

The molded case circuit breakers shall have inverse time and instantaneous tripping characteristics. Automatic tripping of the breaker shall be clearly indicated by the handle position. Contacts shall be non-welding silver alloy and arc extinction shall be accomplished by means of arc chutes.

The circuit breaker rating shall be as specified on the plans and as required by the load and coordination studies.

Ground fault protection shall be provided where indicated. Shunt trips, bell alarms and auxiliary switches shall be provided.

### **10-3.26 CLOSEOUT SUBMITTALS**

One set of the half-size project plans, on 279 mm x 432 mm in size, shall be kept on file by the Contractor for the sole purpose of recording electrical as-built information. As-built information recorded by the Contractor on the project plans shall include the following:

1. All clarification and change orders.
2. Location of underground utilities.
3. All changes in size, manufacture, or location of features.

All corrections shall be made in red ink or red pencil. Superseded material shall be neatly lined out. Original figures shall not be eradicated nor written over. Each sheet shall be clearly marked as having "As-Built Changes" or "No As-Built Changes" as appropriate.

Supplemental plan sheets shall be included when as-built information cannot be clearly shown on project plans. Supplemental plan sheets for the as-built shall have the contract number and shall be 279 mm x 432 mm in size and on 75 g/m<sup>2</sup> (minimum) bond paper.

The final location of all underground utilities shall be recorded by depth from finished grade and by offset distance from permanent surface structures. Equipment within the building and all concealed conduits shall be recorded by offset distances from building walls.

Before the final inspection, the Contractor shall submit the as-built to the Engineer for review to determine completeness and adequacy. If the as-built is unacceptable, the Contractor shall record the required information as directed by the Engineer. If the as-built is acceptable the Contractor shall sign and date the as-built certifying that all the information shown is correct.

The as-built shall be submitted to the Engineer prior to acceptance of the contract.

### **10-3.27 SOFFIT LUMINAIRES**

Ballasts shall be electronic type.

### **10-3.28 PHOTOELECTRIC CONTROLS**

Photoelectric units for illuminated signs shall have a "turn-on" level of between 215 lux and 323 lux (corresponds to a switching level of approximately 430 lux to 646 lux measured in the horizontal plane). "Turn-off" level shall not exceed 3 times the "turn-on" level.

### **10-3.29 SITE SECURITY**

Site security shall include a pedestal mounted card reader and video/intercom station (with face camera, badge and card reader and voice communication to the security console in the Sector Command Center in Building 100

through Building 23), a second pedestal mounted card reader station (with intercom which connects to the security console in the Sector Command Center in Building 100 through Building 23) and all other support equipment for a fully operational system in conformance with the details shown on the plans and these special provisions.

The Contractor shall provide the connection of the cameras mounted on the canopy and guard booth to the Sector Command Center in Building 100 through Building 23.

## **SUBMITTALS**

### **Materials List and Drawings**

A list of materials which the Contractor proposes to install for the site security systems together with the drawings and other data shall be submitted to the Engineer in conformance with the provisions in Section 86-1.04, "Equipment List and Drawings," of the Standard Specifications.

The working drawings shall include wiring diagram for site security systems showing service and connection details. Proper placement, mounting height and orientation of the equipment shall conform to the manufacturer's requirements for the system provided.

Before the completion of the contract, but after approval of the operational site security system, one set of the approved detailed information and diagrams shall be placed in a heavy-duty plastic envelope. The envelope shall be attached securely to the inside of the guard house or at a convenient location designated by the Engineer.

The Contractor shall be responsible for the compatibility and adjustment of components as necessary for the successful operation of the completed installation.

### **Certificate of Compliance**

The Contractor shall provide the Engineer a Certificate of Compliance from the manufacturer, in conformance with the provisions of Section 6-1.07, "Certificates of Compliance," of the Standard Specifications. The certificate shall certify that the site security system comply with the requirements of these specifications. The certificate shall also include a copy of all test reports on the installed final configuration of the site security system reviewed and approved by the manufacturer.

## **MATERIALS**

The site security system shall be from a manufacturer registered and in compliance with ISO 9001. The manufacturer shall be able to support the Contractor through training, demonstrations, site surveys and technical assistance as needed to meet the required site security system requirements as defined in these special provisions.

A pedestal mounted card reader and video/intercom station at the entry gate shall contain a face camera and badge reader, card reader as well as voice communication to the security console in the Sector Command Center in Building 100. The face camera and badge reader shall connect to vehicle gate and shall open the gate when signaled from the security console. The card reader shall open the gate automatically. Voice communication shall be possible without pressing a switch except for "ringing" the distant end. The following are the minimum requirements for the pedestal:

1. Face camera shall be color with high resolution: Kalatel # KTC215C, Pelco #CC3700H-2 or equal with 13VD3-8 auto iris lens, or equal.
2. Badge reader and voice communicator: Kalatel #KTR-11C, Aiphone AX-DVF-P with black and white camera, with 13VD3-8 auto iris lens, or equal.
3. Pedestal: Kalatel # KTR-91, Pedestalceo Model 36-9C, or equal.
4. Card Reader: Secura Key Entacomp #265A with power supply, Kalatel #KTP-24C, outdoor rated.
5. Weatherproof Head: Kalatel #KTR-90, Guru ENCL-16X16-CS or equal
6. Cables as required.

A second pedestal mounted card reader station shall contain an intercom which connects to the security console in the Sector Command Center in Building 100. The following are the minimum requirements for the second pedestal:

1. Intercom: Tamperproof, heavy duty construction and compatible with the other site security equipment, recommended by the site security manufacturer for the attended application and approved by the Engineer in writing prior to ordering.
2. Pedestal: Kalatel # KTR-91, Pedestalceo Model 36-9C, or equal.
3. Cables as required

The following equipment shall be located at the security console in the Sector Command Center in Building 100:

1. Data signal distributor shall be installed at the security center to allow communication with all of the camera receivers and face badge readers (new and existing) in a star configuration. Kalatel KTD-83, Pelco CM9760-CDU-T, or equal.
2. DTMF Signal Merger shall allow for multiple DTMF call inputs so that both new and existing Face/Badge readers can operate simultaneously. DTMF Signal Merger shall be Kalatel # KTD-86, Holtek HT9170, or equal
3. Cables as required

### **Ethernet Switch**

The Contractor shall install and test the Ethernet switch as shown on the project plans. The Ethernet switch shall have twenty four 10/100Base-TX ports and a minimum of two Small Form Factor Pluggable (SFP) slots. The Ethernet switch shall connect to the Fiber Optic(FO) patch panel and to various security communication equipment as shown on the plans.

**Technical Requirements.**-- The Ethernet switch shall meet or exceed the following minimum requirements:

Parameter	Specification
Number of Ethernet ports	24 each, 10/100Base-TX RJ45 Auto-negotiation, full duplex
SFP slots	2 each, Gigabit Fiber 100/1000Base-FX/SX/LX, half and full duplex
Switch Architecture	Store-and-Forward
LED	Power, Link/Activity
Power	From 9.6 V(dc) to 60 V(dc) or from 90 V(ac) to 240 V(ac).
Power consumption	210 Watts Max and 717 BTU/h Max
Mechanical Requirement	1 each Rack Unit form factor
Electromagnetic Emissions	FCC Part 15, Class A CE
Standards Compliance	IEEE 802.3u Fast Ethernet 100Base-TX, IEEE 802.3z 1000BASE-SX/LX, IEEE802.3X Flow control, IEEE 802.1q VLAN tagging, IEEE 802.1d Rapid Spanning Tree Algorithm, IEEE 802.1x Port Authentication Network Control
Management Interface	Console, Web-based interface, SSL
Operating Temperature	From -40 to +70 °C
Humidity	Non-condensing from 10 to 90 percent
Warranty	1 year Min

**SFP Modules.**-- The Small Form Factor Pluggable(SFP) Fiber Transceiver modules shall be installed in the SFP slots of the Ethernet Switch per the manufacturers guidelines. The SFP modules and the Ethernet Switch shall be from the same manufacturer. The SFP modules shall be of appropriate type depending on the distance covered by the fiber link and shall be compatible with LC ( Standard # IEC-61754-20) type fiber connectors. The SFP modules shall be one of the following types and have the following specifications:

SFP Module Type	Throughput	Fiber Type	Wavelength	Transmit Power (dBm)	Receive Power (dBm)	Maximum Cable Distance
100BASE-FX	100 Mbps	Multimode	1310 nm	-14 to -20	-14 to 31	2 km
1000BASE-LX	1000 Mbps	Multimode	1310 nm	-3 to -9.5	-3 to -20	10 km
1000BASE-SX	1000 Mbps	Multimode	850 nm	-3 to 9.5	0 to -17	550 m

All SFP modules shall support a minimum connection distance of 2 meters.

### **Cable Requirements**

Low voltage cables shall be either 18 or 22 AWG, twisted pairs as required.  
Video cables shall be R59/U coaxial.  
Audio cable shall be 18 AWG, 4 twisted pair, shielded.

## **MEASUREMENT AND PAYMENT**

Full compensation for site security shall be considered as included in the contract lump sum price paid for YBI electrical utility relocations and no additional compensation will be allowed therefor.

### **10-3.30 ACCESS CONTROL SYSTEM**

#### **GENERAL**

This work includes installing the access control system to be compatible with the existing United States Coast Guard (USCG) security system, including programming and testing of the system for the system operation, at the location as shown on the plans and as specified in the special provisions.

The access control system (ACS) includes:

1. Ground retractable (active) vehicle barrier
2. Access control panel(s) (ACP)
3. Access control card readers
4. Security video camera system, which is to be installed as specified in Section 12, "Building Work," of these special provisions.
5. Intercom video station, copper cable category 5e and optical fiber cabling
6. Cables and conductors
7. Miscellaneous hardware
8. Connection of the ACS to the server room in Building 23 (which currently communicates with the Sector Command Center in Building 100). Ensure new ACS is compatible and operable with existing ACS in Sector Command Center in Building 100.

#### **Submittals**

Submit shop drawings for fabrication, installation and erection of all parts of the work. Provide detail drawings containing complete wiring and schematic diagrams. Provide details required to demonstrate that the system has been coordinated and will properly function as a unit. Show proposed layout of equipment and appurtenances. Show equipment relationships to other parts of the work.

#### **Quality Control and Assurance**

Provide the Engineer with a Certificate of Compliance from the manufacturer in conformance with the provisions in Section 6-1.07, "Certificates of Compliance," of the Standard Specifications. The Certificate of Compliance must certify that the ACS furnished conforms to the contract plans and specifications, and was manufactured in conformance with the approved quality control program.

## **MATERIALS**

#### **ACS Performance and Requirements**

The ACP must meet or exceed the following performance and regulatory requirements:

1. Underwriters' Laboratories Compliance: Satisfy all UL 294 requirements in terms of design documentation, and installation. All aspects of the enclosures, power supplies, relays, circuit breakers, controllers, reader-port circuit boards, I.P. interface hardware and cabling must meet the requirements of UL 294.
2. Ethernet Connectivity: ACP hardware and software must possess the ability to connect controllers, servers and workstations through Ethernet to USCG's LAN or WAN. All aspects of the controller and I.P. interface hardware must meet the requirements of UL 294. Where controllers are equipped and installed with I.P. modules, the hardware must also be able to be installed in a way that fully satisfies UL 294.
3. Event Processing Performance:
  - 3.1. Maximum card access transaction time of 0.5 seconds
  - 3.2. Alarm processing time of 4 seconds or less
4. Processing Multiple Bit Formats: ACP must possess controllers which can concurrently process different card populations and which can process any Wiegand bit format up to 64 bits.

5. Controllers:

- 5.1. ACP must control gate operators and ground retractable (active) vehicle barrier.
- 5.2. Provide "flash", online-upgradeable firmware.
- 5.3. Provide a clock within each controller so that USCG can perform all time-related changes and activities while off-line from the server.

6. Report Management: ACP must provide users the ability to use common report-generating software (such as Crystal Reports) to create a report on any of the systems' database or history records and to store and manipulate reports within the application itself.

7. Alarm Presentation: Alarm management screen must have the following attributes and functions:

- 7.1. ACP software must present alarms on the alarm screen in a "double-sort" fashion, with priority as the first sort, and initiation time as the second sort. Sort order must refresh in real time upon each addition or deletion of active alarm events.
- 7.2. USCG must have the ability to govern permissions granted to alarm management screen operators, and the option to deny them the ability to modify sort preferences.

8. Communication Cables:

8.1. Telecommunication Industry Association (TIA):

TIA/EIA-455-3-A	(May 1989) Procedures to Measure Temperature Cycling Effects on Optical Fibers, Optical Cables, and Other Passive Fiber Optic Components
TIA/EIA-455-5-B	(June 1990) Humidity Test Procedures for Fiber Optic, Connecting Devices
TIA/EIA-455-30B	Frequency Domain Measurement of Optical Fiber Transmission Carrying Capacity
TIA/EIA-455-31-C	FOTP-31 Proof Testing Optical Fibers by Tension
TIA/EIA-455-33A	Fiber Optic Cable Tensile Loading and Bending Test
TIA/EIA-455-41-A	FOTP-41 Compressive Loading Resistance of Fiber Optic Cables
TIA/EIA-455-46-A	FOTP-46 Spectral Attenuation Measurement for Long-Length, Graded-Index Optical Fibers
TIA/EIA-455-47-B	FOTP-47 Output Far-Field Radiation Pattern Measurement
TIA/EIA-455-51A	Pulse Distortion Measurement of Multi-mode Glass Optical Fiber Information Capacity
TIA/EIA-455-53A	FOTP-53 Attenuation by Substitution Measurement – for Multimode Graded-Index Optical Fiber or Fiber Assemblies Used in Long-Length Communications systems
TIA/EIA-455-59-A	FOTP 59 Measurement of Fiber Point Defects Using an OTDR
TIA/EIA-455-61-A	FOTP 61 Measurement of Fiber or Cable Attenuation
TIA/EIA-455-81A	Compound Flow (Drip) Test for Filled Fiber Optic Cable
TIA/EIA-526-14A	Optical Power Loss Measurements of Installed Multimode Fiber Cable Plant
TIA/EIA-568-B.3	Optical Fiber Cabling Components Standard April 2000
TIA/EIA-598-A	Color Coding of Fiber Optic Cables

8.2. Underwriters Laboratories, Inc. (UL):

UL 497	Protectors for Communications Circuits
UL 1581	(Reference Standard for Electrical Wires, Cables and Flexible Cords

8.3. Category 5e as defined in TIA/EIA-568-B.2, when field tested after installation in conformance with Chapter 11 Cabling Transmission Performance and Test Requirements of TIA/EIA-568-B.1, with the test measurements performed using a Level II-E field tester as defined in Annex I of TIA/EIA-568-B.2.

- 8.4. Fiber Optic Cabling: Optical Budget (any end to end link not to exceed the sum of the following):
  - 8.4.1. The optical fiber specified cable performance, pro-rated for total link distance, not to exceed the following for multimode cable:
    - 8.4.1.1. At 850 nanometers, 3.5 dB per kilometer
    - 8.4.1.2. At 1300 nanometers, 1.5 dB per kilometer
  - 8.4.2. Splices (Multimode): 0.15 dB for each fusion splice
  - 8.4.3. Connectors (Multimode): 0.5 dB for each mated pair of SC connectors
- 9. User Permissions:
  - 9.1. ACP must offer a "matrix" approach to the granting of operator permissions. Provide different groups of operator the ability to manipulate any programmable set of system functions.
  - 9.2. Provide USCG with the capability to limit or control operators' ability to view, edit, add or delete any fields or attributes of the database.
- 10. Operator Audit Trail: Create a record of, and provide the ability to create reports of, all operator actions within the ACP software, including:
  - 10.1. The time a change was made by an operator
  - 10.2. The operator's name
  - 10.3. The item's state before the change was made
  - 10.4. The item's state after the change
- 11. Swipe and Show: ACP must provide a "swipe-and-show" function, enabling the operator's screen to instantly "pop up" the photo image of a cardholder when he or she presents a credential to a reader.
- 12. Badging Integration with ACP: Badging system software must be seamlessly integrated with the access control software suite. Ensure that, as a rule, when updates or upgrades become available for the access control portion of the software, the badging software application (along with technical support available for it) is also concurrently updated by the same software manufacturer.
- 13. Modularity: Provide components designed for modular increase or decrease of system capability by installation or removal of plug-in modules. Design system components to facilitate modular subassembly and part replacement.
- 14. Maintainability: Components must be capable of being maintained using commercially available standard tools and equipment. Components must be arranged and assembled to be readily accessible to maintenance personnel without compromising defeat resistance of ACP.
- 15. Availability: Provide components designed for continuous operation. Provide solid-state electronic components, mounted on printed circuit boards conforming to UL 796. Boards must be plug-in, quick-disconnect type. Circuitry must not be so densely placed as to impede maintenance. Power-dissipating components must incorporate safety margins of not less than 25 percent with respect to dissipation ratings, maximum voltages, and current-carrying capacity. Light duty relays and similar switching devices must be solid-state type or hermetically sealed electromechanical. Electrical indicating instruments incorporated into system components shall conform to applicable provisions of ANSI C39.1.

#### **ACS Manufacturers**

The ACS, which must compatible with the current security system installed at the USCG Building 100 Command Center is available from one of the following manufacturers (or approved equal):

- 1. Sabah International  
5925 Stoneridge Drive, Pleasanton, CA 94588  
Telephone: (925) 224-7725  
Fax: (925) 463-1047

2. Smith & Wesson Security Solutions <sup>TM</sup>  
277 Mallory Station Road, Suite 112  
Franklin, TN 37067  
Telephone: (615) 224-0400  
Fax: (615) 224-0411  
www.smith-wessonsecuritysolutions.com
3. NEU Security Services  
400 W. 15th Street, Suite 712  
Austin, TX 78701  
Telephone: (512) 469-9980  
Fax: (512) 686-3304  
www.neusecurity.com

## **CONSTRUCTION**

Do not interrupt operation of the existing USCG security system.  
Coordinate with USCG for the ACS installation:

1. Integrate new entrance security system with the existing USCG ACS located in Sector Command Centers (SCC) in Building 100 including the security video camera system, which is to be installed as specified in Section 12, "Building Work," of these special provisions, and ground retractable (active) vehicle barrier.
2. Connect the ACP to the Sector Command Centers (SCC), Building 23.
3. Install multi-tech readers that are 14443 CAC compatible with 125 kHz proximity readers.
4. Install intercom video station with a clear and bright image with color TFT LCD mounted on the exterior grade pedestal. The image view area shall be approximately 600 mm horizontal, from 1.12 to 2.36 m vertical and 1.30 m high at 508 mm in front of camera.
5. Provide appropriate conductors for all security devices, per schedules in the detail package.
6. Install security devices and components.
7. Install accessible components with tamperproof security fasteners.
8. Install enclosures, cabinets, housings, boxes, raceways, and fittings with hinged doors or removable covers which contain circuits of the access control system and associated power supplies with cover having corrosion-resistant tamper switches. Arrange tamper switches to initiate an alarm signal when the door or cover is moved 6-mm from the normally closed position.
9. Install system cabling and terminations in accordance with manufacturer's instructions.
10. Install necessary interconnections, services, and adjustments required for a complete and operable system shall be provided. All installation work must be done in accordance with the safety requirements set forth in the general requirements of ANSI C2 and NFPA 70.
11. Install continuous and splice-free wires and cables for entire length of run between designated connections and terminations.
12. Verify all raceway has been de-burred, properly joined, coupled and terminated prior to installation of cables.
13. Verify raceway is clear of foreign matter prior to installation of cable. Inspect all conduits to verify proper bend radius.
14. Provide test reports for all cable installations:
  - 14.1. Category 5e per TIA/EIA-568-B.2 using a Level II-E field tester
  - 14.2. Fiber optic cabling per ANSI/TIA/EIA-526-14-A

## **MEASUREMENT AND PAYMENT**

Full compensation for access control system shall be considered as included in the contract lump sum price paid for YBI electrical utility relocations and no additional compensation will be allowed therefor.

### **10-3.31 GROUND RETRACTABLE (ACTIVE) VEHICLE BARRIER**

#### **GENERAL**

This work includes installing, programming, testing, and making fully operational a ground retractable (active) vehicle barrier compatible with the United States Coast Guard (USCG) base on Yerba Buena Island. The work shall include the following:



1. Reusable ground-retractable automobile barrier system
2. Anchor stanchions
3. Electronically controlled, electrically operated lift arms
4. Integrated net
5. Operating controls and logic
6. Power circuits
7. Accessories

### **Definitions**

**Ground Retractable (Active) Vehicle Barrier.**--An attenuating device designed to span a roadway or traffic lane to bring an encroaching vehicle to a stop and prevent its passage. The system consists of a steel anchor post at each end and a cable/net assembly. The anchor posts are made from a sub-grade box frame and a steel I-beam post. The net consists of upper and lower extra-high-strength wire strands, with a wire rope in the center and vertical wire rope sections attached to the top, middle, and bottom cables with clamps.

### **Submittals**

Submit shop drawings for fabrication, and installation of all parts of the work. Provide detail drawings containing complete wiring and schematic diagrams, and any other details required to demonstrate that the system has been coordinated and will properly function as a unit. Show proposed layout and anchorage of equipment and appurtenances, and equipment relationship to other parts of the work including foundation and clearances for maintenance and operation.

Submit spare parts data for each different item of material and equipment used, after approval of the shop drawings. Include in the data a complete list of parts and supplies, with current unit prices and source of supply. Provide a manufacturer's standard recommended spare parts package, with current unit prices and source of supply complete with detailed manuals on parts replacement, with each barrier to facilitate one-year of normal operation. Give particular consideration to system components which are not readily available from local or commercial sources and which are critical to the operation of the system.

Submit six copies of operation and maintenance manuals, to be provided a minimum of two weeks prior to field training. Manuals shall be approved prior to acceptance. Operation manuals shall outline the step-by-step procedures required for system startup, operation, and shutdown. The manuals shall include the manufacturer's name, model number, service manual, parts list, and brief description of all equipment and their basic operating features. Maintenance manuals shall include routine maintenance procedures. The manuals shall include equipment layout, and checklists containing basic troubleshooting procedures.

### **Quality Control and Assurance**

The Contractor shall provide the Engineer a Certificate of Compliance from the manufacturer, in conformance with the provisions of Section 6-1.07, "Certificates of Compliance," of the Standard Specifications. The certificate shall certify that the ground retractable (active) vehicle barrier system comply with the requirements of these specifications.

The ground retractable (active) vehicle barrier system shall be tested and certified to meet ASTM F2656, Impact Condition Designation M40, Penetration Rating P2, with capability of stopping a 6,810 kg vehicle traveling at speeds up to 65 km/h under ASTM F2656-07 Standard Test Method as issued in designation F 2656-07 published August 2007.

The barrier system shall operate satisfactorily under the following environmental conditions:

1. Temperature: The barrier system shall be able to function in extreme temperature ranges from -29 to 49 °C regardless of humidity.
2. Flooding: The barrier system shall be operable during flood conditions of up to 150-mm of standing water on the road surface.

The barrier system shall meet the following requirements:

1. Reduced Risk of Injury: The barrier system shall, by design, inherently reduce risk of injury to vehicle occupants using a steel cable net to arrest the vehicle. Energy absorbing techniques shall be incorporated into the barrier design to reduce the forces on the vehicle occupants at impact.
2. Bi-Directional Barrier: The barrier system shall be designed to stop a vehicle attempting to gain unauthorized entry from either direction.

3. Reusable/resettable Barrier: The barrier system shall be designed to be a reusable barrier and be re-settable in as little as 30 minutes after impact.
4. Emergency Operation: The barrier system shall be capable of being raised in less than 2 seconds when activated by the emergency deploy button.
5. Barrier Application: The barrier system shall be configured in accordance with site conditions. A single barrier system may span the entire roadway which must be secured. Roadway widths from 3.6 m to 18.3 m shall be supported by a single certified barrier system.
6. Foundation: The foundation shall require an excavation depth of no greater than 460-mm as measured from the roadway surface. The foundation shall utilize a rebar reinforced concrete slab to properly anchor the barrier system.
7. Anchor Stanchion: Anchor stanchions shall be set in a concrete foundation for transference of energy upon impact. When retracted, the net of the barrier system shall be recessed into the roadway surface in order to ensure smooth vehicle crossing. When deployed, the barrier shall present an obstacle to approaching vehicles. Upon impact, forces shall be first absorbed by net, pistons, and anchor stanchions before being transferred to the foundation of the unit.
8. Net: The net shall use high strength aircraft cable and be assembled with high pressure pressed-swage fittings. The typical net height shall be approximately 1.3 m as measured from the top of the net to the finished road surface. Typical net height from grade shall be approximately 356-mm to bottom of the net. Length of net shall be determined by width of the roadway, height of crown in roadway, and other site conditions. The net shall be raised and lowered in a 90 degree fashion by the lifting arms.
9. Pre-Deployment Position: The net shall be recessed in virgin rubber pads made of materials typically used in grade level railroad crossings. The rubber pads shall be 127-mm thick with recessed preformed pattern to accept net in the pre-deployment position.
10. Lifting Arm Assembly: Each lifting arm assembly shall be equipped and operated by a variable frequency drive (VFD) 3 hp (up to 10 hp) electric motor. The size of the electric motor shall depend on the length of net specified. The motor shall be inverter duty rated. Electric motor shall have double shaft ends and C-face mount for direct inputs and direct torque transfer. Each lifting arm assembly shall incorporate a single rectangular steel mast with a single pivot point to raise and lower the net. The lifting arm shall incorporate shear pins for net release in the event of an impact. The specified barrier shall not utilize pneumatic or hydraulic pumps, rams or hoses to deploy the barrier. Power off operation shall be accommodated by means of a simple drive accessible from the front of the motor assembly.
11. Badging Integration with Access Control Panel (ACP): Install an ACP whose badging system software is (or can be) seamlessly integrated with access control software suite. Ensure that, as a rule, when updates or upgrades become available for the access control portion of the software, the badging software application (along with technical support available for it) is also concurrently updated by the same software manufacturer.
12. Configuration: The system consists of a steel anchor post at each end and a cable/net assembly. The anchor posts are made from a sub-grade box frame and a steel I-beam post. The net consists of upper and lower 38-mm diameter Extra High Strength (EHS) wire strands, with a 16-mm diameter wire rope in the center and 16-mm diameter vertical wire rope sections attached to the top, middle, and bottom cables with clamps.
13. Multiple Barrier Application: Each barrier system shall have its own control and operate independently from each other as well as simultaneously under necessary conditions.

## **MATERIALS**

The ground retractable (active) vehicle barrier system shall be obtained from one of the following manufacturers (or approved equal):

1. Smith & Wesson Security Solutions  
277 Mallory Station Rd Ste 112  
Franklin, TN 37067  
Telephone: (615) 224-0400  
Fax: (615) 224-0411
2. NEU Security Services  
400 W. 15th Street Suite 712  
Austin, TX 78701  
Telephone: (512) 469-9980  
Fax: (512) 686-3304

3. Barrier1 Systems, Inc.  
8015 Thorndike Rd  
Greensboro, NC 27409  
Telephone: (336) 617-8478  
Fax: (336) 617-048471

The entire anti-ram barrier system, and all associated gates, accessories, fittings, and fasteners shall be obtained from a single source.

Material and equipment shall be the standard products of a manufacturer regularly engaged in the manufacture of such products.

Provide appropriate conductors for all security devices, per schedules in the plans.

## **CONSTRUCTION**

Coordination with USCG is critical. Do not interrupt any functioning system.

Aesthetics are an important consideration in this installation. Install all components to provide aesthetically pleasing results. Coordinate the actual locations of all visible components in advance with USCG.

Install all ground retractable (active) vehicle barrier materials at locations shown on the plans in accordance with manufacturer's specifications.

Carefully review all details for exact type and quantity of parts and devices required to support security apparatus.

Locate and install all security devices and components in accordance with the details and plans, and in accordance with the manufacturer's recommendations, including, the following:

1. Foundation: Constructed of 27.6 MPa concrete. The barrier system foundation shall require an excavation depth of no greater than 460-mm as measured from the roadway surface. The foundation shall utilize a rebar reinforced concrete slab to properly anchor the barrier system.
2. Finish: Surfaces shall be coated in accordance with the manufacturer's requirements. All exposed surfaces shall be powder coat finished or liquid spray with UV inhibitors for extended paint life and oven cured for final moisture barrier. White and red coloring for net in roadway shall be provided for by means of a replaceable, flexible PVC wrap.
3. Main Power: Power requirements as applicable to site, shall be one of the following: 240 V(ac) 1 Phase, 208 V(ac) 3 Phase, or 480 V(ac) 3 Phase. Power shall be provided to the barrier system at a single point, with a circuit size determined by the size of the barrier and the power available.
4. Control Circuit: A control circuit shall be provided to interface between the control panel and the barrier system. This control circuit shall contain all relays, timers, programmable logic circuits and other devices necessary for operation. The control circuit shall include all necessary control logic to override the normal up-down operation in the event of an emergency deployment.
5. Primary Control Panel: The primary control panel shall be supplied to control all barrier system functions. The control circuit shall contain all relays, timers, and an industrial programmable controller programmed as necessary for the barrier operation. Optional terminals may be provided to interface with client access control systems and operation devices. The primary control panel shall be a stainless steel NEMA 4X enclosure approximately 1.5 meter by 0.9 meter by 0.305 meter deep or as applicable. Terminal strips shall be provided to interconnect all devices.
6. Barrier System Sensors - Suppression Loops: Two inductive loops whose outputs shall be used to prevent barriers rising when a vehicle is within a prescribed distance of the barrier. The output of the loops shall override all barrier rise signals until 1/2 second after a vehicle clears the suppression loop.
7. Barrier System Accessory - Traffic Lights: Red/yellow 203-mm traffic lights shall be supplied for each entrance and exit to alert motorists of the barrier position. The yellow flashing light shall indicate that the barrier is fully open. All other positions shall cause the light to show red.
8. Barrier Heater: A waterproof resistive element barrier heater with a thermostat control and NEMA 4 junction box connection point shall be provided for de-icing and snow melting. The heater shall provide barrier operation to an ambient temperature of -29 °C.
9. Electrical Work: Motors, automatic motor control equipment and protective or signal devices required for the operation specified shall be provided as specified in these special provisions. Coordinate with the Engineer for definition of electrical scope of work. The barrier system shall have all electric operation, accomplish normal and emergency up-down operation without the use of pneumatics, hydraulic pumps, cylinders, hoses or reservoirs.
10. Controls: A master and remote control panel shall be provided to interface between all barrier control stations and the power unit. The same control panel may be provided for multiple barriers where

applicable. The control circuit shall contain all relays, timers, and other devices or an industrial programmable controller programmed as necessary for the barrier operation.

11. Main Operator Panel: A main operator panel shall be supplied to control barrier functions. This panel shall have a key-lockable main switch with main power "ON" and panel "ON" lights. Buttons to raise and lower each barrier shall be provided. Barrier "UP" and "DOWN" indicator lights shall be included for each barrier. An emergency fast operate circuit (EFO) shall be operated from a push button larger than the normal controls and have a flip safety cover installed over the push button or toggle switch. The EFO shall have an EFO-active light and reset button. The main control panel shall have a key lockable switch to arm or disable the remote operator panels. An indicator light shall show if the remote control panel is enabled.
12. Remote Operator Panel: A remote operator panel (where applicable) shall have a panel "ON" light that is lit when enabled by a key lockable switch on the main control panel. Buttons to raise and lower each barrier shall be provided. Barrier "UP" and "DOWN" indicator lights shall be included for each barrier. The EFO shall be operated from a push button larger than the normal controls and have a flip safety cover installed over the push button or toggle switch. Activation of either EFO will operate all barriers. The EFO shall be interconnected with an EFO-active light. When the remote control panel EFO is pushed, operation of the barrier will not be possible from this panel until reset at the main control panel or maintenance panel.
13. Installation: Install systems in accordance with manufacturer's recommendations. Perform primary installation, adjustment and testing in the presence of a representative of the manufacturer. Inspect installation and adjust operable components to operate properly, without binding or warping. Check and readjust operating hardware. Clean soiled surfaces to remove dirt, fingerprints, adhesives, and other foreign materials according to manufacturer's written instructions. Remove and replace defaced or damaged components that cannot be satisfactorily repaired.
14. Field Testing: Upon completion of construction, perform a field test for each unit. For barriers, the test shall include raising and lowering the barrier through its complete range of operation, as well as the complete testing of all safety devices, accessories, and associated signaling and warning devices. Furnish equipment and make necessary corrections and adjustments. Conditions that interfere with the proper operation of the barrier disclosed by the test shall be corrected at no additional cost. After adjustments are made to assure correct functioning of components, applicable tests shall be completed until satisfactory results are obtained.
15. Demonstration: Provide the services of a manufacturer-authorized field-service representative to demonstrate and train applicable personnel in operations and maintenance procedures.

#### **MEASUREMENT AND PAYMENT**

Full compensation for ground retractable (active) vehicle barrier shall be considered as included in the contract lump sum price paid for YBI electrical utility relocations and no additional compensation will be allowed therefor.

#### **10-3.32 DISPOSING OF ELECTRICAL EQUIPMENT**

Fluorescent light ballasts which contain polychlorinated biphenyls (PCBs) shall be disposed of in conformance with the California Department of Toxic Substances Control (DTSC) Regulations set forth in Title 22, Division 4.5, Chapter 42, of the California Code of Regulations.

Ballasts and transformers that contain polychlorinated biphenyl (PCB) are designated as extremely hazardous wastes and fluorescent tubing and mercury lamps are designated as hazardous wastes under Title 22, Division 4.5, Chapter 11, Article 4.1 and Article 5, of the California Code of Regulations.

The State assumes generator responsibility for these wastes. The Engineer will prepare the Hazardous Waste Manifest for Shipment. Ballasts shall be packaged and transported to a hazardous waste disposal facility. The Contractor shall package and transport fluorescent lights to an appropriately permitted facility.

#### **PAYMENT**

Full compensation for hauling, stockpiling, and disposing of transformers, fluorescent tubing and mercury lamps and non-leaking fluorescent light ballasts shall be considered as included in the contract price paid for the various items of work and no additional compensation will be allowed therefor.

#### **10-3.33 REMOVING, REINSTALLING OR SALVAGING ELECTRICAL EQUIPMENT**

The following salvaged electrical materials shall be hauled to the District Electrical Maintenance Station, 30 Rickard Street, San Francisco, CA 94134, (415) 330-6509 and stockpiled:

1. Aircraft beacon(s)
2. Navigation and aviation light fixtures

3. Fog bell(s)
4. Fog horns at Pier E-2 and Pier E-3
5. Fog detector at Pier E-3
6. Decorative light fixtures
7. Pier light fixtures
8. Construction cameras:
  - 8.1. Three construction cameras between Piers E3 and E-4
  - 8.2. Two construction cameras on south-south detour eastbound north side
  - 8.3. Two construction cameras at Pier E2
  - 8.4. Three construction cameras at Pier E3
  - 8.5. One construction camera at Pier E1 north side
9. Seismographic stations
10. Overhead Change Message Sign Panel located on upper deck at Pier E-1.
11. Overhead Change Message Sign Panel located on upper deck at Pier E-6.

The Contractor shall provide the equipment, as necessary, to safely unload and stockpile the material. A minimum notice of 2 business days shall be given prior to delivery.

### **10-3.34 PAYMENT**

The contract lump sum prices paid for the following items shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in the listed items below, complete in place, including manuals, preparation and delivery of any and all proposals, plans, submittals, and other documents to the Engineer, warranty work and modifications, software and software changes, testing and training, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

1. Underground
2. YBI transition structures roadway westbound
3. YBI transition structures roadway and girder eastbound
4. Traffic operation system
5. Call box system
6. YBI electrical utility relocations
7. Remove and salvage electrical devices

The contract unit price paid for each of the following items shall include full compensation for furnishing all materials, tools, equipment, and incidentals required for the traffic operations system, as shown on the plans, as specified in these special provisions, and as directed by the Engineer.

1. Preformed Loop Detector Station (10 Loops per Station)
2. Fiber Optic Data Modems
3. Fiber Optic Splice Closure

The contract price paid in meters for each of the following items shall include full compensation for furnishing the materials as shown on the plans, as specified in these special provisions, and as directed by the Engineer.

1. Fiber Optic Cable (72-Fiber Indoor/Outdoor).
2. Fiber Optic Cable (12-Fiber Indoor/Outdoor).

If any of the fabrication sites for the materials listed are located more than 480 air line kilometers from both Sacramento and Los Angeles, additional shop inspection expenses will be sustained by the State. Whereas it is and will be impractical and difficult to determine the actual increase in these expenses, it is agreed that payment to the Contractor for furnishing these listed materials from each fabrication site located more than 480 air line kilometers from both Sacramento and Los Angeles will be reduced \$2000:

1. Service equipment enclosures
2. Telephone demarcation cabinets
3. Closed circuit television cabinets furnished by the Contractor

## **SECTION 11. (BLANK)**

## **SECTION 12. BUILDING WORK**

### **SECTION 12-1. GENERAL REQUIREMENTS**

#### **12-1.01 SCOPE**

Building work described herein and as shown on the plans shall conform to the requirements of these special provisions and Sections 1 through 9 of the Standard Specifications. Sections 10 through 95 of the Standard Specifications shall not apply to the work in this Section 12 except when specific reference is made thereto.

The building work to be done consists, in general, of the following facilities and such other items or details, not mentioned below, that are required by the plans, Standard Specifications, or these special provisions shall be performed, placed, constructed or installed.

1. Utility stairs
2. Parking canopy
3. Permanent guard booth with canopy including mechanical and electrical works, except other electrical work as specified in, "Signals, Lighting and Electrical Systems," of these special provisions.
4. Historic stairs
5. USCG stairs

#### **12-1.02 ABBREVIATIONS**

Section 1-1.02, "Abbreviations," of the Standard Specifications is amended by adding the following:

AAMA	American Architectural Manufacturers' Association
ACI	American Concrete Institute
AGA	American Gas Association
AITC	American Institute of Timber Construction
AMCA	Air Movement and Control Association
APA	American Plywood Association
ARI	American Refrigeration Institute
ASHRAE	American Society of Heating, Refrigeration and Air Conditioning Engineers
CBC	California Building Code (2001 Edition)
CEC	California Electrical Code (2001 Edition)
CMC	California Mechanical Code (2001 Edition)
CPC	California Plumbing Code (2001 Edition)
CS	Commercial Standards (US Department of Commerce)
ESO	Electrical Safety Orders
FGMA	Flat Glass Marketing Association
FM	Factory Mutual
FS	Federal Specification
ICBO	International Conference of Building Officials
NAAMM	National Association of Architectural Metal Manufacturers
NBFU	National Board Fire Underwriters
NEC	National Electrical Code
NFPA	National Fire Protection Association or National Forests Products Association
PEI	Porcelain Enamel Institute
PS	Product Standard (US Department of Commerce)
RIS	Redwood Inspection Service
SCPI	Structural Clay Products Institute
SMACNA	Sheet Metal and Air Conditioning Contractors' National Association
SSPC	Steel Structures Paint Council
TCA	Tile Council of America
TPI	Truss Plate Institute
UBC	Uniform Building Code (1997 Edition)

WCLIB	West Coast Lumber Inspection Bureau (stamped WCLB)
WCLB	Grade stamp for WCLIB
WIC	Woodwork Institute of California
WWPA	Western Wood Products' Association

### **12-1.03 GUARANTEE**

The Contractor hereby unconditionally guarantees that the building work will be done in accordance with the requirements of the contract, and further guarantees the building work of the contract to be and remain free of defects in workmanship and materials for a period of one year from the date of acceptance of the contract, unless a longer guarantee period is required elsewhere in these special provisions. The Contractor hereby agrees to repair or replace any and all building work, together with any other adjacent work which may be displaced in so doing, that may prove to be not in accordance with the requirements of the contract or that may be defective in its workmanship or material within the guarantee period specified, without any expense whatsoever to the Department, ordinary wear and tear and unusual abuse or neglect excepted.

The performance bond for contract price of the building work, shall remain in full force and effect during the guarantee period.

The Contractor further agrees, that within 10 calendar days after being notified in writing by the Department of any building work not in accordance with the requirements of the contract or any defects in the building work, he shall commence and prosecute with due diligence all work necessary to fulfill the terms of this guarantee, and shall complete the work within a reasonable period of time, and, in the event he fails to comply, he does hereby authorize the Department to proceed to have such work done at the Contractor's expense and he shall honor and pay the cost and charges therefor upon demand. The Department shall be entitled to all costs and expenses, including reasonable attorney's fees, necessarily incurred upon the Contractor's refusal to honor and pay the above costs and charges.

### **12-1.04 AREAS FOR CONTRACTOR'S USE**

Attention is directed to the provisions in Section 5, "Areas for Contractor's Use," of these special provisions.

### **12-1.05 COOPERATION**

Attention is directed to the provisions in Section 10, "Cooperation," of these special provisions.

The Contractor shall plan his work to minimize interference with State forces and the public. Interruptions to any services for the purpose of making or breaking a connection shall be made only after consultation with and for such time periods as directed by the Engineer.

### **12-1.06 SUBMITTALS**

Working drawings, material lists, descriptive data, samples and other submittals specified in these special provisions shall be submitted for approval in accordance with the provisions in "Working Drawings," of these special provisions.

Attention is directed to the provisions in Section 5-1.01, "Authority of Engineer," of the Standard Specifications. The Engineer may request submittals for materials or products where submittals have not been specified in these special provisions, or may request that additional information be included in specified submittals, as necessary to determine the quality or acceptability of such materials or products.

Attention is directed to Section 6-1.05, "Trade Names and Alternatives," of the Standard Specifications. The second indented paragraph of the first paragraph of said Section 6-1.05 is amended to read:

Whenever the specifications permit the substitution of a similar or equivalent material or article, no test or action relating to the approval of such substituted material will be made until the request for substitution is made in writing by the Contractor accompanied by complete data as to the equality of the material or article proposed. Such request shall be made within 35 days after the date the contract has been approved and in ample time to permit approval without delaying the work, but need not be made in less than 35 days after award of the contract.

Work requiring the submittal of working drawings, material lists, descriptive data, samples, or other submittals shall not begin prior to approval of said submittal by the Engineer. Fifteen working days shall be allowed for approval or return for correction of each submittal or resubmittal. Should the Engineer fail to complete his review within the time specified and if, in the opinion of the Engineer, the Contractor's controlling operation is delayed or interfered with by reason of the delay in review, an extension of time commensurate with the delay in completion of

the work thus caused will be granted as provided in Section 8-1.07, "Liquidated Damages," of the Standard Specifications.

Submittals shall be delivered to California Department of Transportation, Office of the Resident Engineer, Contract 04-0120T4, 333 Burma Rd, Oakland, CA 94607.

Each submission of drawings, material lists and descriptive data shall consist of at least 5 copies. Two copies will be returned to the Contractor either approved for use or returned for correction and resubmittal.

Each separate item submitted shall bear a descriptive title, the name of the project, district, county, and contract number. Plans and detailed drawings shall be not larger than 559 mm x 914 mm.

The material list shall be complete as to name of manufacturer, catalog number, size, capacity, finish, all pertinent ratings, and identification symbols used on the plans and in the special provisions for each unit.

Parts lists and service instructions packaged with or accompanying the equipment installed in the work shall be delivered to the Engineer at the jobsite. Required operating and maintenance instructions shall be submitted in triplicate.

Manufacturer's warranties for products installed in the work shall be delivered to the Engineer at the jobsite.

Unapproved samples and samples not incorporated in the work shall be removed from State property, when directed by the Engineer.

#### **12-1.07 PROGRESS SCHEDULE**

Attention is directed to the provisions in Section 10, "Progress Schedule (Critical Path Method)," of these special provisions.

#### **12-1.08 SCHEDULE OF VALUES**

The Contractor shall prepare and submit to the Engineer for approval 2 copies of a Schedule of Values within 15 working days of approval of the contract covering each lump sum item for building work. Fifteen working days shall be allowed for approval or return for correction of each submittal or resubmittal. Should the Engineer fail to complete his review within the time specified and if, in the opinion of the Engineer, the Contractor's controlling operation is delayed or interfered with by reason of the delay in review, an extension of time commensurate with the delay in completion of the work thus caused will be granted as provided in Section 8-1.07, "Liquidated Damages," of the Standard Specifications.

The Schedule of Values must be accurately divided into sections representing the cost of each separate building or structure. All work that is not part of a separate building or structure, such as excavation, grading, curbs, gutters, sidewalks, paving, sewer and storm drainage and utility distribution lines are to be included under a specific section as General Work and not included in the building or structure cost. Indirect costs and general condition items are to be listed as a separate line item of work. The sections representing each building or structure must be identified as to the building or structure they represent and be broken down to show the corresponding value of each craft, trade or other significant portion of the work. A sub-total for each section shall be provided.

The Schedule of Values shall be approved by the Engineer before any partial payment estimate is prepared.

The sum of the items listed in the Schedule of Values shall equal the contract lump sum price for building work. Overhead and profit shall not be listed. Bond premium and other such items will not be paid for under the various building work items and shall be included in the mobilization bid item for the entire project.

#### **12-1.09 INSPECTION**

All items covered or all stages of work that are not to remain observable must be inspected and approved before progress of work conceals portions to be inspected. The Contractor shall notify the Engineer not less than 72 hours in advance of when such inspection is needed.

#### **12-1.10 OBSTRUCTIONS**

Attention is directed to Sections 5-1.18, "Property and Facility Preservation," 7-1.11, "Preservation of Property," 7-1.16, "Contractor's Responsibility for the Work and Materials," and 8-1.10, "Utility and Non-Highway Facilities," of the Standard Specifications, and the provisions in Section 10, "Nonhighway Facilities (Including Utilities)," of these special provisions.

The Contractor shall notify the Engineer and the appropriate regional notification center for operators of subsurface installations at least 5 working days prior to performing any excavation or other work close to any underground pipeline, conduit, duct, wire or other structure. Regional notification centers include but are not limited to the following:



Underground Service Alert  
Northern California (USA)  
Telephone: 1(800)642-2444

Underground Service Alert  
Southern California (USA)  
Telephone: 1(800)422-4133

South Shore Utility  
Coordinating Council (DIGS)  
Telephone: 1(800)541-3447

Western Utilities  
Underground Alert, Inc.  
Telephone: 1(800)424-3447

#### **12-1.11 PRESERVATION OF PROPERTY**

Attention is directed to Sections 7-1.11, "Preservation of Property," 7-1.16, "Contractor's Responsibility for the Work and Materials," and 8-1.10, "Utility and Non-Highway Facilities," of the Standard Specifications.

Operations shall be conducted in such a manner that existing facilities, surfacing, installations, and utilities which are to remain in place will not be damaged. Temporary surfacing, facilities, utilities and installations shall also be protected until they are no longer required. The Contractor, at his expense shall furnish and install piling, sheet piling, cribbing, bulkheads, shores, or whatever means may be necessary to adequately support material carrying such facilities, or to support the facilities themselves and shall maintain such support until they are no longer needed.

#### **12-1.12 UTILITY CONNECTION**

The Contractor shall make all arrangements, and obtain all permits and licenses required for the extension of and connection to each utility service applicable to this project, shall furnish all labor and materials necessary for such extensions which are not performed or provided by the utility, and shall furnish and install any intermediate equipment required by the serving utilities.

Upon written request by the Contractor, the State will pay all utility permits, licenses, connection charges, and excess length charges directly to the utility. Such request shall be submitted not less than 45 days before service connections are required.

The costs incurred by the Contractor for the extensions of utilities beyond the limits shown on the plans, and in furnishing and installing any intermediate equipment required by the serving utilities, will be paid for as extra work as provided in Section 4-1.03D of the Standard Specifications.

Full compensation for any costs incurred by the Contractor to obtain the permits and licenses shall be considered as included in the contract lump sum price paid for building work and no additional compensation will be allowed therefor.

#### **12-1.13 TEMPORARY UTILITIES**

The Contractor shall make his own arrangements to obtain any additional electrical power and water or other utilities required for his operations and shall make and maintain the necessary service connections at his own expense.

When existing utility systems are being modified, periods of shutdown will be determined by the Engineer.

The Contractor shall provide adequate temporary lighting to perform the work and allow the Engineer to inspect the project as each portion is completed.

The Contractor shall provide and pay for telephone service he may require. State telephone facilities shall not be used.

#### **12-1.14 SANITARY FACILITIES**

When operational, State sanitary facilities will not be available for use by the Contractor's employees. Tools shall not be cleaned nor shall cleaning liquids be disposed of in State sanitary facilities or sewers.

During toilet room renovation or other periods when State-owned sanitary facilities are not operational, the Contractor shall provide and pay for wash facilities, drinking water fixtures and a minimum of two temporary toilet units for State forces. Separate toilet facilities shall be provided for Contractor's personnel. Facilities shall include the periodic flushing, waste removal and cleaning of such facilities. Units shall to be maintained in a clean and

sanitary condition, including a supply of toilet tissue, toilet seat covers, paper towels and paper cups. Waste material shall be disposed of offsite in a lawful manner. Temporary toilet units shall be single occupant units of the chemical, aerated recirculation or combustion type, properly vented and fully enclosed with a glass fiber reinforced polyester shell or similar nonabsorbent material.

#### **12-1.15 MEASUREMENT AND PAYMENT**

The contract lump sum price paid for building work shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in constructing the building work, including all mechanical and electrical work, and structure excavation and structure backfill for the building work, complete in place, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

Full compensation for any incidental materials and labor, not shown on the plans or specified, which are necessary to complete the buildings and appurtenances shall be considered as included in the contract lump sum price paid for building work and no additional compensation will be allowed therefor.

#### **12-1.16 PROJECT RECORD DRAWINGS**

The Contractor shall prepare and maintain one set of project record drawings, using an unaltered set of original project plans, to clearly show all as-constructed information for the project. As a minimum, the information to be shown shall include 1) any plan clarifications or change orders, 2) locations of any underground utilities, or 3) the location, size, type, and manufacturer of all major products or components selected by the Contractor for use in the work.

All markings shall be placed on the project record drawings using red ink or red pencil. Original figures shall not be eradicated nor written over and superseded material shall be neatly lined out. Additional drawings shall be submitted if the required information cannot be clearly shown on the original set of project plans. The additional drawings shall be not less than 279 mm x 432 mm in size and shall have the contract number on each sheet. The Contractor shall sign and date each sheet of the project record drawings to verify that all as-constructed information shown on the drawings is correct.

The Contractor shall periodically review the set of project record drawings with the Engineer during the progress of the work to assure that all changes and other required information are being recorded.

Before completion of the work, the Contractor shall request a review of the project record drawings to determine the completeness and adequacy of them. If the project record drawings are unacceptable, the Contractor shall inspect, measure, and survey the project as necessary to record the required additional information.

The set of completed project record drawings shall be delivered to the Engineer prior to acceptance of the contract.

#### **12-1.17 FIELD ENGINEERING**

This section specifies administrative and procedural requirements for field engineering services to be performed by the Contractor.

**Lines and grades.--**Attention is directed to Section 5-1.07 "Lines and Grades," of the Standard Specifications.

Such stakes or marks will be set by the Engineer as he determines to be necessary to establish the lines and grades required for the completion of the work shown on the plans and as specified in these special provisions. In general, these will consist of the primary vertical and horizontal control points.

Stakes and marks set by the Engineer shall be carefully preserved by the Contractor. In case such stakes and marks are destroyed or damaged they will be replaced at the Engineer's earliest convenience. The Contractor will be charged for the cost of necessary replacement or restoration of such stakes and marks which in the judgment of the Engineer were carelessly or willfully destroyed or damaged by the Contractor's operations. This charge will be deducted from any moneys due or to become due the Contractor.

All other stakes or marks required to establish the lines and grades required for the completion of the work shall be the responsibility of the Contractor.

**Existing utilities and equipment.--**The existence and location of underground and other utilities and construction indicated as existing are not guaranteed. Before beginning sitework, the Contractor shall investigate and verify the existence and location of underground utilities and other construction.

Prior to construction, the Contractor shall verify the location and invert elevation at points of connection of sanitary and septic sewers, storm sewer, and water or fire service piping.

**Surveys for layout and performance.**--The Contractor shall perform all surveys for layout and performance, reduce field notes, and make all necessary calculations and drawings necessary to carry out the work.

The Contractor shall locate and layout site improvements, and other work requiring field engineering services, including pavements, stakes for grading, fill and topsoil placement, utility slopes and invert elevations by instrumentation and similar appropriate means.

Batter boards shall be located and laid out for structures, building foundations, column grids and locations, floor levels and, control lines and levels required for mechanical and electrical work.

**Survey accuracy and tolerances.**--The tolerances generally applicable in setting survey stakes for foundations, slabs, and underground work shall not exceed the following:

Survey Stakes or Markers	Tolerance
Rough grading or excavation	30 mm
Trimming or preparation of subgrade for roadways	15 mm
Roadway surfacing, steel or concrete pipe	6 mm
Structures or building construction	3 mm

Such tolerance shall not supersede stricter tolerances required by the plans or special provisions, and shall not otherwise relieve the Contractor of responsibility for measurements in compliance therein.

#### **12-1.18 SUBSTITUTION OF NON-METRIC MATERIALS AND PRODUCTS**

Only materials and products conforming to the requirements of the specifications shall be incorporated in the work. When metric materials and products are not available, and when approved by the Engineer, and at no cost to the State, materials and products in the inch-pound (imperial) system which are of equal quality and of the required properties and characteristics for the purpose intended, may be substituted for the equivalent metric materials and products, subject to the following requirements:

Materials and products shown on the plans or in the special provisions as being equivalent may be substituted for the metric materials and products specified or detailed on the plans.

Before other non-metric materials and products will be considered for use the Contractor shall furnish, at the Contractor's expense, evidence satisfactory to the Engineer that the materials and products proposed for use are equal to or better than the materials and products specified or detailed on the plans. The burden of proof as to the quality and suitability of substitutions shall be upon the Contractor and the Contractor shall furnish all information necessary as required to the Engineer. The Engineer will be the sole judge as to the quality and suitability of the substituted materials and products and the Engineer's decision shall be final.

When the Contractor elects to substitute non-metric materials and products, including materials and products shown on the plans or in the special provisions as being equivalent, a list of substitutions to be made shall be submitted for approval.

The following substitutions of materials and products will be allowed:

SUBSTITUTION TABLE FOR SIZES OF HIGH STRENGTH STEEL FASTENERS, ASTM Designation: A 325M	
METRIC SIZE SHOWN ON THE PLANS mm x thread pitch	IMPERIAL SIZE TO BE SUBSTITUTED inch
M16 x 2	5/8
M20 x 2.5	3/4
M22 x 2.5	7/8
M24 x 3	1
M27 x 3	1-1/8
M30 x 3.5	1-1/4
M36 x 4	1-1/2

SUBSTITUTION TABLE FOR REINFORCEMENT	
METRIC BAR DESIGNATION NUMBER AS SHOWN ON THE PLANS	IMPERIAL BAR DESIGNATION NUMBER TO BE SUBSTITUTED
10	3
13	4
16	5
19	6
22	7
25	8
29	9
32	10
36	11
43	14
57	18

SUBSTITUTION TABLE FOR WELDED PLAIN WIRE REINFORCEMENT, ASTM DESIGNATION: A 185	
	US CUSTOMARY UNITS SIZE TO BE SUBSTITUTED inch <sup>2</sup> x 100
MW9	W1.4
MW10	W1.6
MW13	W2.0
MW15	W2.3
MW19	W2.9
MW20	W3.1
MW22	W3.5
MW25	W3.9, except W3.5 in piles only
MW26	W4.0
MW30	W4.7
MW32	W5.0
MW35	W5.4
MW40	W6.2
MW45	W6.5
MW50	W7.8
MW55	W8.5, except W8.0 in piles only
MW60	W9.3
MW70	W10.9, except W11.0 in piles only
MW80	W12.4
MW90	W14.0
MW100	W15.5

The sizes in the following tables of materials and products are exact conversions of metric sizes of materials and products and are listed as acceptable equivalents:

CONVERSION TABLE FOR SIZES OF: (1) STEEL FASTENERS FOR GENERAL APPLICATIONS, ASTM Designation: A 307 or AASHTO Designation: M 314, Grade 36 or 55, and (2) HIGH STRENGTH STEEL FASTENERS, ASTM Designation: A 325 or A 449	
DIAMETER	
METRIC SIZE SHOWN ON THE PLANS mm	EQUIVALENT IMPERIAL SIZE inch
6, or 6.35	1/4
8 or 7.94	5/16
10, or 9.52	3/8
11, or 11.11	7/16
13 or 12.70	1/2
14, or 14.29	9/16
16, or 15.88	5/8
19, or 19.05	3/4
22, or 22.22	7/8
24, 25, or 25.40	1
29, or 28.58	1-1/8
32, or 31.75	1-1/4
35, or 34.93	1-3/8
38 or 38.10	1-1/2
44, or 44.45	1-3/4
51, or 50.80	2
57, or 57.15	2-1/4
64, or 63.50	2-1/2
70 or 69.85	2-3/4
76, or 76.20	3
83, or 82.55	3-1/4
89 or 88.90	3-1/2
95, or 95.25	3-3/4
102, or 101.60	4

CONVERSION TABLE FOR NOMINAL THICKNESS OF SHEET METAL			
UNCOATED HOT AND COLD ROLLED SHEETS		HOT-DIPPED ZINC COATED (GALVANIZED) SHEETS	
METRIC THICK- NESS SHOWN ON THE PLANS mm	EQUIVA- LENT US STAND- ARD GAGE  inch	METRIC THICK- NESS SHOWN ON THE PLANS mm	EQUIVA- LENT GALVAN- IZED SHEET GAGE inch
7.94	0.3125		
6.07	0.2391		
5.69	0.2242		
5.31	0.2092		
4.94	0.1943		
4.55	0.1793		
4.18	0.1644	4.270	0.1681
3.80	0.1495	3.891	0.1532
3.42	0.1345	3.510	0.1382
3.04	0.1196	3.132	0.1233
2.66	0.1046	2.753	0.1084
2.28	0.0897	2.372	0.0934
1.90	0.0747	1.994	0.0785
1.71	0.0673	1.803	0.0710
1.52	0.0598	1.613	0.0635
1.37	0.0538	1.461	0.0575
1.21	0.0478	1.311	0.0516
1.06	0.0418	1.158	0.0456
0.91	0.0359	1.006 or 1.016	0.0396
0.84	0.0329	0.930	0.0366
0.76	0.0299	0.853	0.0336
0.68	0.0269	0.777	0.0306
0.61	0.0239	0.701	0.0276
0.53	0.0209	0.627	0.0247
0.45	0.0179	0.551	0.0217
0.42	0.0164	0.513	0.0202
0.38	0.0149	0.475	0.0187

CONVERSION TABLE FOR WIRE		
METRIC THICKNESS SHOWN ON THE PLANS	EQUIVALENT USA STEEL WIRE THICKNESS	GAGE NO.
mm	inch	
6.20	0.244	3
5.72	0.225	4
5.26	0.207	5
4.88	0.192	6
4.50	0.177	7
4.11	0.162	8
3.76	0.148	9
3.43	0.135	10
3.05	0.120	11
2.69	0.106	12
2.34	0.092	13
2.03	0.080	14
1.83	0.072	15
1.57	0.062	16
1.37	0.054	17
1.22	0.048	18
1.04	0.041	19
0.89	0.035	20

CONVERSION TABLE FOR COMMON NAILS				
NAIL SIZE	METRIC		ENGLISH	
	mm		inch	
	Length	Diameter	Length	Diameter
8d	63.5	3.33	2 1/2	0.131
10d	76.2	3.76	3	0.148
16d	88.9	4.11	3 1/2	0.162

CONVERSION TABLE FOR LUMBER	
METRIC NOMINAL SURFACE DRY SIZE	EQUIVALENT NOMINAL SURFACE DRY U S SIZE
mm	inch
51	2
102	4
152	6
203	8
254	10
305	12



CONVERSION TABLE FOR PLYWOOD	
METRIC mm	ENGLISH inch
6.4	1/4
7.9	5/16
9.5	3/8
11.1	7/16
11.9	15/32
12.7	1/2
15.1	19/32
15.9	5/8
18.3	23/32
19.1	3/4
22.2	7/8
25.4	1
28.6	1 1/8

CONVERSION TABLE FOR INSULATION R-VALUE	
METRIC (K m <sup>2</sup> /W)	ENGLISH (HR FT <sup>2</sup> F/BTU)
0.5	3
0.7	4
1.4	8
1.9	11
2.3	13
2.5	14
3.3	19
5.3	30

CONVERSION TABLE FOR VAPOR TRANSMISSION RATING	
METRIC (Perm-m)	ENGLISH (perm-inch)
0.29	0.02

CONVERSION TABLE FOR LOW PRESSURE	
METRIC (Pa)	ENGLISH (Inches of Water Column)
30	0.125
60	0.25
90	0.375
120	0.50
150	0.60
155	0.625
175	0.70
185	0.75
200	0.80
250	1.00
310	1.25

CONVERSION TABLE FOR PRESSURE	
METRIC (kPa)	ENGLISH (psi)
10	1.5
210	30
280	40
350	50
690	100
860	125
1040	150
1100	160
1210	175
1380	200
1730	250
2070	300
2170	315
2410	350
2590	375
2760	400
4830	700
5170	750
5520	800
13800	2000
17200	2500
20700	3000
27600	4000
34500	5000
137900	20000

CONVERSION TABLE FOR MIL THICKNESS	
METRIC (mm)	ENGLISH (inch/1000)
0.10	4
0.13	5
0.15	6
0.50	20
0.75	30
1.00	40

CONVERSION TABLE FOR HVAC DUCTING.	
METRIC (mm)	ENGLISH (inch)
100	4
125	5
150	6
175	7
200	8
225	9
250	10
300	12
360	14
410	16
460	18
510	20
560	22
610	24
660	26
710	28
760	30

CONVERSION TABLE FOR MECHANICAL PIPING		
METRIC (GSP, PVC, BSP, DUCTILE IRON)	METRIC (mm)	ENGLISH (inch)
NPS 1/2	15	1/2
NPS 3/4	20	3/4
NPS 1	25	1
NPS 1 1/4	32	1 1/4
NPS 1 1/2	40	1 1/2
NPS 2	50	2
NPS 2 1/2	65	2 1/2
NPS 3	75	3
NPS 4	100	4
NPS 6	150	6

CONVERSION TABLE FOR LUBRICATION PIPING TUBING WALL THICKNESS	
METRIC (mm)	ENGLISH (inch)
2.1	0.083
0.9	0.035

CONVERSION TABLE FOR HOSE/TUBING SIZES O. D.	
METRIC (mm)	ENGLISH (inch)
6	1/4
10	3/8
13	1/2
16	5/8
19	3/4
22	7/8
25	1

CONVERSION TABLE FOR DRUM SIZES			
METRIC		ENGLISH	
L	kg	gallons	pounds
205	180	55	400
60	55	16	120
19	16	5	35

CONVERSION TABLE FOR POWER	
METRIC (kW)	ENGLISH (HP)
0.037	1/20
0.075	1/10
0.18	1/4
0.25	1/3
0.37	1/2
0.55	3/4
0.75	1
1.1	1 1/2
1.5	2
2.2	3
3.7	5
5.5	7 1/2
7.5	10
11	15
15	20
18.5	25
22	30
30	40
37	50
45	60
55	75
75	100
90	120
110	150

CONVERSION TABLE FOR IMPELLER BALANCE		
SYNCHRONOUS RPM	METRIC (g mm/kg)	ENGLISH (ounce- inch/pound)
720	94	0.059
900	73	0.046
1200	54	0.034
1800	41	0.026
3600	17	0.011

CONVERSION TABLE FOR ELECTRICAL CONDUIT	
METRIC SIZE SHOWN ON THE PLANS mm	EQUIVALENT IMPERIAL SIZE inch
16	1/2
21	3/4
27	1
35	1 1/4
41	1 1/2
53	2
103	4

## SECTION 12-2. SITEWORK

### 12-2.01 CLEARING AND GRUBBING

#### PART 1.-- GENERAL

##### SUMMARY

**Scope.--**This work shall consist of removing all objectionable material from the building site in accordance with the details shown on the plans and these special provisions.

Clearing and grubbing shall be performed in advance of any other grading or construction operations.

The area to be cleared and grubbed shall be within the building work construction area.

##### SITE CONDITIONS

**Traffic.--**Clearing and grubbing shall be conducted to ensure minimum interference with roads, street, walks or other occupied areas.

**Protection of existing landscaping and trees.--**Existing landscaping and trees which are to remain in place shall be protected from injury or damage. Existing trees shall be protected with a temporary fence around the drip line.

#### PART 2.- PRODUCTS (Not applicable.)

#### PART 3.- EXECUTION

##### SITE CLEARING

**General.--**Remove trees, shrubs, grass and other vegetation, concrete and masonry, improvements, or obstructions interfering with the new construction.

Trees to be removed shall be grubbed to a depth of not less than 0.6 meter below finished grade.

## **REMOVAL OF WASTE MATERIAL**

**Hauling.**--When hauling is done over highways or city streets, and when directed by the Engineer, the loads shall be trimmed and all material removed from shelf areas of the vehicles.

**Disposal.**--Shrubs, grass, weeds and other vegetation, debris, , and any obstructions above or below the ground surface that interfere with the building work, shall be removed and disposed of outside the highway right of way in accordance with Section 7-1.13 of the Standard Specifications.

## **12-2.02 EARTHWORK FOR BUILDING WORK**

### **PART 1.- GENERAL**

#### **SUMMARY**

**Scope.**--This work shall consist of performing earthwork for building work in accordance with the details shown on the plans and these special provisions.

Earthwork for building work shall consist of structure excavation and structure backfill. Structure excavation shall include excavation for footings, foundations, walls, and slabs. Structure backfill shall include backfilling under slabs; backfilling under and around footings; backfilling for walls, backfilling for pipes and conduits; and backfilling holes resulting from removal of existing facilities. In addition to structure excavation and structure backfill, earthwork for building work shall include any other earthwork, not mentioned, but necessary to complete the building work.

Attention is directed to the Materials Information Handout for information regarding foundation recommendations and reports that were prepared for use during the design of this project, and are available as Information Handout as specified in "Supplemental Project Information," of these special provisions.

Attention is directed to the requirements of "Field Engineering" in Section 12-1, "General Requirements," of these special provisions.

#### **QUALITY ASSURANCE**

**Samples.**--Samples of sand, pea gravel, or crushed stone, weighing not less than 11 kg, shall be submitted to the Engineer at the jobsite for approval.

#### **SITE CONDITIONS**

**Existing underground piping and conduit.**--The location of existing underground piping and conduit is based on the best records available. Before beginning work, the Contractor shall accurately locate the piping and conduit involved in the work. If the location of the existing piping or conduit deviates from the location shown on the plans by more than 1.5 meters, or, if no elevations are indicated and the piping or conduit is more than 0.9 meter below grade, the cost of the additional excavation, backfill, piping or conduit, and removal and replacement of concrete, if any, will be paid for as extra work as provided in Section 4-1.03D of the Standard Specifications.

**Existing surfaced or planted areas.**--Existing surfaced or planted areas that are removed, broken or damaged by the Contractor's operations shall be restored to their original condition except as otherwise shown on the plans or specified herein.

Restoration materials shall be equal to or better than the original materials. Surfacing shall be replaced to match the material thickness, grades, and finish of the adjacent surrounding surfaces.

## PART 2.- PRODUCTS

### BACKFILL MATERIALS

#### Structure backfill

Structure and trench backfill shall be free of organic and other deleterious material and shall be suitable for the required compaction. Gravel without sand matrix shall not be used except as free draining granular material beneath slabs and footings.

#### Sand

Sand shall be clean, washed sand, free from clay or organic material graded such that 100 percent passes the 6 mm sieve, 90 percent to 100 percent passes the 4.75 mm sieve and not more than 5 percent passes the 75  $\mu$ m sieve size.

#### Pea gravel (naturally rounded)

Pea gravel (naturally rounded) shall be clean, washed, dry density of not less than 1522 kg/m<sup>3</sup>, free from clay or organic material and shall conform to the following grading as determined by California Test 202:

Sieve or Screen Size	Percentage Passing
19 mm	100
13 mm	90-100
9.5 mm	40-70
4.75 mm	0-15
2.36 mm	0-3

Pea gravel shall conform to the following requirements:

Test	California Test No.	Test Requirements
Durability Index	229	35 Min.

## PART 3.- EXECUTION

### PREPARATION & RESTORATION

**Sawcutting.**--Prior to excavation or trenching, existing surfacing shall be removed to saw cut lines, or to existing wood dividers or expansion joints, if any. The saw cut shall be to a neat line and have a depth not less than 25 mm.

**Restoration.**--Surfacing shall be replaced to match the thickness, grades and finish of the adjacent surrounding surfaces.

### STRUCTURE EXCAVATION

**General.**--Unless otherwise noted, all excavation for building work shall be classified as structure excavation.

**Footing excavation.**--The bottom of excavation shall not be disturbed. The Contractor shall excavate by hand to the final grade. The bottom of concrete footings shall be poured against undisturbed material. Unless otherwise noted, compaction of the bottom of footing excavation is not required unless the material is disturbed. The footing depths shown on the plans shall be changed to suit field conditions when directed by the Engineer. Solid rock at or near required depths shall not be disturbed. Unsuitable material shall be excavated down to firm bearing as directed

by the Engineer. Work and materials required because of excavation in excess of the depths shown on the plans, when such excavation has been ordered by the Engineer, will be paid for as extra work as provided in Section 4-1.03D of the Standard Specifications.

Excavate to the elevations and dimensions within a tolerance of  $\pm 12$  mm. Limits of the excavation shall allow for adequate working space for installing materials and as required for safety of personnel. Such working space excavation shall be replaced in kind and compacted at the Contractor's expense.

Overdepth excavation for footings shall be backfilled with concrete or such other material recommended by the Contractor and approved by the Engineer. Relative compaction shall be not less than 95 percent.

**Excavation for pipes and conduits.**--Pipes or conduits in the same trench shall have a minimum clear distance between pipes or conduits of 150 mm. Pipes or conduits shall have not less than 0.75 meter of cover from top of pipes or conduits to finished grade unless otherwise shown on the plans or specified.

Trenching shall be of sufficient depth to permit placing a minimum depth of 100 mm of compacted sand under all pipes and conduits.

Excavation adjacent to trees shall be performed by hand methods where necessary to avoid injury to trees and roots. Roots 50 mm in diameter and larger shall be protected with heavy burlap. Roots smaller than 50 mm in diameter adjacent to trees shall be hand trimmed. Cuts through roots 13 mm in diameter and larger shall be sealed with tree trimmers' asphaltic emulsion. If trenches remain open more than 24 hours, the side of the trench adjacent to the tree shall be shaded with burlap and kept damp. Materials shall not be stockpiled within the drip line of trees.

**Dewatering.**--Excavations shall be kept clear of standing water. Water shall be removed by pumping if necessary. Water removed from excavation shall be carried away from the building site and disposed of in a manner that will not harm State or adjacent property.

## STRUCTURE BACKFILLING

**General.**--Unless otherwise noted, all backfill for building work shall be classified as structure backfill. Backfill shall be placed and compacted in horizontal layers, not more than 150 mm thick prior to compaction, and to the lines and grades shown on the plans or to original ground.

**Structure backfill.**--After structures are in place and forms are removed, wood and other debris shall be removed from excavations before placing structure backfill.

**Backfilling pipes and conduits.**--Backfill placed under pipe and conduits shall be compacted sand, 100 mm minimum depth. Backfill material placed to a level 150 mm above tops of pipes and conduits shall be sand or fine earth and particles shall not exceed 13 mm in greatest dimension. For wrapped, coated, or plastic pipe or conduits, sand shall be used for backfill. Backfill material placed higher than 150 mm above tops of pipes or conduits shall consist of material free of stones or lumps exceeding 100 mm in greatest dimension except:

- (a) The top 300 mm of backfill under roads, walks or paving shall consist of aggregate base material.
- (b) The top 150 mm of backfill in planted areas shall consist of topsoil.

Unless otherwise shown on the plans, pipe under roads, with less than 0.75 m of cover over the top of pipe, shall be backfilled with concrete to a level 100 mm above the top of pipe. Concrete for backfill shall be commercial quality concrete containing not less than 350 kg/m<sup>3</sup> of cement.

## COMPACTION

**General.**--Relative compaction shall be determined in accordance with California Test 216 or 231.

Unless otherwise noted below, all backfill shall be compacted to a minimum relative compaction of 90 percent. Unless approved in writing by the Engineer, compaction by jetting or ponding will not be permitted.

**Compact original ground.**--Original ground surface under fill with surfacing of concrete and asphalt concrete shall be compacted to a relative compaction of not less than 95 percent for a minimum depth of 150 mm.

**Subgrade preparation.**--Preparation of subgrade material for placing aggregate base, surfacing, or slabs thereon shall include fine grading, compaction, reworking as necessary. The upper 150 mm of the subgrade shall have the same compaction as the fill to be placed over it.



The prism of backfill directly underneath the building foundation and sloping downward at 1:1 shall be compacted to 95 percent.

**Structure backfill.**--Structure backfill shall be compacted to not less than 95 percent relative compaction.

**Trench backfill.**--Trench backfill placed beneath slabs or paved areas shall be compacted to a relative compaction of not less than 95 percent.

## **DISPOSAL**

**Surplus material.**--Surplus material from the excavation shall be removed and disposed of outside the right-of-way in accordance with Section 7-1.13 of the Standard Specifications.

## **FIELD QUALITY CONTROL**

**Inspection.**--When the excavation is substantially completed to grade, the Contractor shall notify the Engineer. No concrete shall be placed until the foundation has been approved by the Engineer.

**Testing.**--The State will conduct compaction tests during the backfilling and compacting operations.

## **12-2.03 FREE DRAINING GRANULAR MATERIAL**

### **PART 1.- GENERAL**

#### **SUMMARY**

**Scope.**--This work shall consist of furnishing and placing free draining granular material beneath slabs in accordance with the details shown on the plans and these special provisions.

### **PART 2.- PRODUCTS**

#### **Free draining granular material**

Free draining granular material shall be clean, hard, durable, free-draining rock. The material gradation shall be such that all passes the 25 mm screen, and not more than 10 percent passes the 4.75 mm sieve as determined by California Test 202. Granular material shall be free from organic material, clay balls or other deleterious substances.

### **PART 3.- EXECUTION**

#### **SPREADING AND CONSOLIDATING**

**General.**--Free draining granular material shall be placed, spread and consolidated by tamping or vibrating.

## **12-2.04 CAST-IN-DRILLED-HOLE CONCRETE PILES**

### **PART 1.- GENERAL**

#### **SUMMARY**

**Scope.**--This work shall consist of constructing cast-in-drilled-hole concrete piles in accordance with the details shown on the plans and these special provisions.

## **PART 2.-PRODUCTS**

### **Concrete and reinforcement**

Concrete and reinforcement shall conform to the requirements specified under "Cast-In-Place Concrete" in Section 12-3, "Concrete and Reinforcement," of these special provisions.

## **PART 3.-EXECUTION**

### **CONSTRUCTION**

**Drilling holes.**--All holes for concrete piles shall be drilled to the tip elevations or depths shown on the plans. All holes shall be examined for straightness and any hole which on visual inspection from the top shows less than 1/2 the diameter of the hole at the bottom of the hole shall be rejected. Suitable casings shall be furnished and placed when required to prevent caving of the hole.

All loose material existing at the bottom of the hole after drilling operations have been completed shall be removed before placing concrete in the hole.

Material resulting from drilling holes shall be wasted on the job site as directed by the Engineer.

Surface water shall not be permitted to enter the hole and all water which may have infiltrated into the hole shall be removed before placing concrete therein.

**Placing reinforcement.**--The reinforcing cage shall be placed and secured symmetrically about the center of the pile and shall be securely blocked to clear the sides of the hole.

Longitudinal reinforcing steel shall be continuous for the entire length of pile, including pile extensions.

**Placing concrete.**--The concrete filling shall be vibrated to a dense and homogeneous condition. Concrete placed in drilled holes shall be placed against undisturbed material except when portions of the pile will be exposed to view. Surfaces exposed to view and adjacent surfaces within 250 mm of finished grade shall be formed.

Casing, if used in drilling operations, shall be removed from the hole as concrete is placed therein. The bottom of the casing shall be maintained not more than 1.5 meter nor less than 0.3 meter below the top of the concrete during withdrawal and placing operations, unless otherwise permitted by the Engineer. Separation of the concrete during withdrawal operations shall be avoided by hammering or otherwise vibrating the casing.

Formed surfaces shall conform to the requirements specified under "Cast-In-Place Concrete" in Section 12-3, "Concrete and Reinforcement," of these special provisions.

## **SECTION 12-3. CONCRETE AND REINFORCEMENT**

### **12-3.01 CAST-IN-PLACE CONCRETE**

#### **PART 1.- GENERAL**

##### **SUMMARY**

**Scope.**--This work shall consist of constructing cast-in-place concrete facilities in accordance with the details shown on the plans and these special provisions.

##### **SUBMITTALS**

**Product data.**--Manufacturer's descriptive data installation and use recommendations for admixtures, expansion joint material, vapor barrier, hardener, and sealer shall be submitted for approval.

Descriptive data shall be delivered to the Engineer at the jobsite.

##### **QUALITY ASSURANCE**

**Certificates of Compliance.**--Certificates of Compliance shall be furnished for cement, reinforcement, epoxy products, and admixtures in accordance with the requirements specified in Section 6-1.07, "Certificates of Compliance," of the Standard Specifications.

A Certificate of Compliance shall be furnished for each shipment of epoxy-coated reinforcing bars certifying that the coated bars conform to the requirements of ASTM Designation: D 3963. Said Certificate of Compliance shall include all certifications specified in ASTM Designation: D 3963 and a statement that the coating material has been prequalified by acceptance testing performed by the National Bureau of Standards or by the Valley Forge Laboratories, Inc., Devon, Pennsylvania.

**Samples.**--Prior to coating, the Contractor shall furnish to the Engineer a representative 0.11 kg sample from each batch of epoxy coating material used. The sample shall be packaged in an airtight container identified with the manufacturer's name and batch number.

After coating, two 800 mm long samples of epoxy-coated reinforcing steel from each size and from each load shipped to the jobsite shall be submitted to the Engineer. The samples shall be representative of the material furnished. The samples, as well as any additional random samples taken by the Engineer, may be tested for specification compliance. Such additional sampling, and all tests performed by the Engineer, may be performed at any location deemed appropriate by the Engineer. Failure of any sample to meet the requirements of the specification will be cause for rejection of all reinforcing bars represented by the sample.

## **PART 2.- PRODUCTS**

### **CONCRETE MIXES.**

#### **Concrete (structural work).**

Commercial quality concrete shall be proportioned to provide a workable mix suitable for the intended use; shall have not less than  $350 \text{ kg/m}^3$  of cement; 0 to 50 mm penetration, inclusive, as determined by California Test 533.

### **CONCRETE MATERIALS**

#### **Cement**

Cement shall conform to ASTM Designation: C 150, Types II, or III portland cement; or Type IP (MS) Modified cement. Type IP (MS) Modified shall conform to ASTM Designation: C 595 and shall be comprised of an intimate mixture of Type II Modified cement and not more than 20 percent of a pozzolanic material.

#### **Aggregates**

Aggregates shall be free from deleterious coatings, clay balls and other extraneous materials.

#### **Admixtures**

Admixtures used in portland cement concrete shall be included on the Department's current list of approved admixtures, and shall conform to ASTM Designation: C 494, Types A, B, D, F or G for chemical admixtures; ASTM Designation: C 260 for air-entraining admixtures; and ASTM Designation: C 618 for mineral admixtures, except loss on ignition shall not exceed 4 percent. Properties of admixtures shall be uniform in each lot.

### **FORM MATERIALS**

#### **Forms for exposed finish concrete**

Forms for exposed surfaces shall be plywood, metal or other panel type materials. Plywood shall be not less than 16 mm thick and without scars, dents, and delaminations. Forms shall be furnished in largest practical pieces to minimize number of joints.

Plywood shall conform to the requirements of U. S. Product Standard PS-1 for Exterior B-B (Concrete Form) Class I.

Forms for edges of slabs shall be nominal 50 mm solid stock lumber, plywood, or metal forms.

**Forms for unexposed finish concrete**

Forms for unexposed finish concrete surfaces shall be plywood, lumber, metal or other acceptable material.

**Forms for cylindrical columns or supports**

Forms for cylindrical columns shall be metal, fiberglass reinforced plastic, paper or fiber tubes. Paper or fiber tubes shall be constructed of laminated plies using water-resistant adhesive with wax-impregnated exterior for protection against weather or moisture.

**Form ties**

Form ties shall be factory fabricated, removable or snapoff metal ties for use as necessary to prevent spreading of forms during concrete placement.

**Form oil**

Form oil shall be commercial quality form oil which will permit the ready release of the forms and will not discolor the concrete.

**REINFORCING MATERIALS****Bar reinforcement**

Bar reinforcement shall conform to ASTM Designation: A 615/A 615M, Grade 60 [420], or ASTM Designation: A 706/A 706M.

**Epoxy coated reinforcement**

The reinforcing steel to be coated shall conform to ASTM Designation: A 615/A 615M, Grade 60 [420], or A 706/A 706M. Epoxy-coated reinforcement shall conform to ASTM Designation: D 775, except that the thickness of the coating shall be 0.2 mm plus or minus 0.05 mm. The coating shall have a light pastel color.

**Bar supports**

Bar supports for reinforcement shall be precast mortar blocks or ferrous metal chairs, spacers, metal hangers, supporting wires, and other approved devices of sufficient strength to resist crushing under applied loads.

**EPOXY****Epoxy resin adhesive**

Epoxy resin adhesive shall conform to State of California Specification No. 8040-21M-08 or other epoxy suitable for bonding new concrete to old.

**RELATED MATERIALS****Anchor bolts, nuts, and washers**

Nonheaded anchor bolts shall conform to ASTM Designation: A 36/A 36M, with a minimum hook length of 6.2 diameters.

Headed anchor bolts shall conform to ASTM Designation: A 307.

Threaded rods shall conform to ASTM Designation: A 572.

Nuts shall conform to ASTM Designation: A 563M, Grade A.

Washers for anchor bolts shall be commercial quality.

Exposed anchor bolts, nuts, and washers shall be hot dipped galvanized.

**Expansion joint material**

Expansion joint material shall be commercial quality asphalt impregnated pressed fiber sheets, 13 mm minimum thickness.

**Vapor barrier**

Vapor barrier shall be not less than 0.38 mm thick and shall conform to the requirements of ASTM Designation: E 1745, Grade A. Tape for overlapped seams shall be as recommended by the manufacturer of the vapor barrier.

**Mortar**

Mortar shall consist of one part cement to 2 parts clean sand and only enough water to permit placing and packing.

**Curing compound**

Curing compound shall be a non-pigmented curing compound with fugitive dye conforming to the requirements of ASTM Designation: C 309, Type 1-D, Class A.

**Concrete hardener**

Concrete hardener shall be commercial quality water borne penetrating type magnesium fluosilicate, zinc fluosilicate or combination thereof.

**ADMIXTURES**

**General.**--Admixtures shall be used when specified or ordered by the Engineer and may be used at the Contractor's option to conserve cement or to facilitate any construction operation.

Calcium chloride shall not be used in any concrete.

Admixtures shall be combined with concrete materials by methods that produce uniform properties throughout the concrete.

If more than one admixture is used, said admixtures shall be compatible with each other so that the desirable effects of all admixtures will be realized.

Mineral admixtures may be used to replace up to 15 percent of Type II portland cement provided the weight of mineral admixture used is not less than the weight of cement replaced. Mineral admixtures shall not be used to replace Type IP (MS) Modified or Type III cements. Chemical admixtures may be used to reduce up to 5 percent of the portland cement except that the cement content shall not be less than 300 kg/m<sup>3</sup>. When both chemical and mineral admixtures are used with Type II cement, the weight of cement replaced by mineral admixture may be considered as cement in determining the resulting cement content.

Mineral admixtures will be required in the manufacture of concrete containing aggregates that are determined to be "deleterious" or "potentially deleterious" when tested in accordance with ASTM Designation: C 289. The use of mineral admixture in such concrete shall conform to the requirements in this section except that the use of set retarding admixtures will not be permitted.

When the use of a chemical admixture is specified or is ordered by the Engineer, the admixture shall be used at the rate specified or ordered. If no rate is specified or ordered, or if the Contractor uses a chemical admixture for his own convenience, the admixture shall be used at the dosage normally recommended by the admixture manufacturer.

When air-entrainment is specified or is ordered by the Engineer, the air-entraining admixture shall be used in amounts to produce concrete having the specified or ordered air content as determined by California Test 504. If the Contractor uses air-entrainment for his own convenience, the average air content shall not exceed 4 percent and no single test shall exceed 5 1/2 percent.

Chemical admixtures and air-entraining admixtures shall be dispensed in liquid form. Dispensers shall have sufficient capacity to measure at one time the total quantity required for each batch. If more than one liquid admixture is used in the concrete, a separate measuring unit shall be provided for each liquid admixture and dispensing shall be such that the admixtures are not mixed at high concentrations. When air-entraining admixtures are used with other liquid admixtures, the air-entraining admixtures shall be the first to be incorporated into the mix. Unless liquid admixtures are added to premeasured water for the batch, they shall be discharged to flow into the stream of water so that the admixtures are well dispersed throughout the batch.

## **BAR REINFORCING STEEL**

**Bending.**--Reinforcing steel bars shall accurately conform to the dimensions shown on the plans.

Bars shall be bent or straightened in a manner that will not crack or break the material. Bars with kinks or improper bends shall not be used.

Hooks, bends and splices shall conform to the provisions of the Building Code Requirements for Reinforced Concrete of the American Concrete Institute.

**Epoxy-coated Reinforcing Steel.**--In fabricating, handling, shipping, and placing of epoxy-coated reinforcing bars, adequate care shall be taken to avoid damage to the coating. Handling and shipping equipment shall have padded contact areas. All bundling bands shall be padded or suitable banding shall be used to prevent damage to the coating. All bundles of coated bars shall be lifted with a strongback or multiple support system to prevent bar-to-bar abrasion from sags in the bundles. Bars or bundles shall not be dropped or dragged.

All damage to the coating caused by handling and fabrication prior to shipment to the jobsite shall be repaired as required by ASTM Designation: D 775. Damage to the coating occurring during shipment or installation, or both, need not be repaired where the damaged areas are 6 mm by 6 mm or smaller and the sum of all damaged areas in each 300 mm length of bar does not exceed 2 percent of the bar surface area. All bars with total damage greater than 2 percent of the bar surface area will be rejected and shall be removed. On bars with a total damaged coating area not exceeding 2 percent of the bar surface area, all damaged areas larger than 6 mm square and all damage in sections of bar with more than 2 percent coating damage in a 300 mm length shall be repaired with patching material. The bar surface area covered by patching material shall not exceed 5 percent of the total surface area of the bar.

Patching material shall be compatible with the coating material, not harmfully reactive with the concrete, and shall be feasible for repairs by the coating applicator or bar fabricator or in the field. The patching material shall be prequalified as required for the coating material and shall be either identified on the container as meeting the requirements of Annex A1 of ASTM Designation: D 775 or shall be accompanied by a Certificate of Compliance certifying that the material meets the requirements of said Annex A1. Patching of damaged areas shall be performed in accordance with the patching material manufacturer's recommendations.

## **MIXING AND TRANSPORTING CONCRETE**

**General.**--When a truck mixer or agitator is used for transporting concrete to the delivery point, discharge shall be complete within 1 1/2 hours, or before 250 revolutions of the drum or blades, whichever comes first, after the introduction of cement to the aggregates.

The temperature of mixed concrete, immediately before placing, shall be not less than 10°C nor more than 32°C.

Truck mixers or agitator shall be equipped with electrically or mechanically actuated revolution counters by which the number of revolutions of the drum or blades may readily be verified. The counters shall be of the continuous-registering type, which accurately register the number of revolutions and shall be mounted on the truck so that the Engineer may safely and conveniently inspect them from alongside the truck. Under conditions contributing to quick stiffening of the concrete, or when the temperature of the concrete is 30°C or above, a time less than 1 1/2 hours may be required.

When non-agitating hauling equipment is used for transporting concrete to the delivery point, discharge shall be complete within one hour after the introduction of cement to the aggregates. Under conditions contributing to quick stiffening of the concrete, or when the temperature of the concrete is 30°C, or above, the time between the introduction of cement to the aggregates and discharge shall not exceed 45 minutes.

Each load of concrete for the work shall be accompanied by a trip ticket, a copy of which shall be delivered to the Engineer at the jobsite. The trip ticket shall show volume of concrete, weight of cement and aggregates, quantity of each admixture, quantity of water including water added at the jobsite, time of day the concrete is batched, and revolution counter readings on transit mix trucks at the times the truck is charged and unloaded.

## **PART 3.- EXECUTION**

### **PREPARATION**

**Existing concrete construction.**--Where fresh concrete joins existing or previously placed concrete or masonry, the contact surfaces of the existing or previously placed material shall be roughened, cleaned, flushed with water and allowed to dry to a surface dry condition immediately prior to placing the fresh concrete. The roughened surface shall be no smoother than a wood trowelled surface. Cleaning of the contact surfaces shall remove laitance,

curing compounds, debris, dirt and such other substances or materials which would prevent bonding of the fresh concrete.

Abrasive blast methods shall be used to clean horizontal construction joints to the extent that clean aggregate is exposed.

Exposed reinforcing steel located at the contact surfaces which is to be encased in the fresh concrete shall be cleaned to remove any substance or material that would prevent bonding of the fresh concrete.

**Forms.--**Forms shall be mortar tight, true to the dimensions, lines, and grades shown on the plans, securely fastened and supported, and of adequate rigidity to prevent distortion during placing of concrete.

Forms for exposed surfaces shall be constructed with triangular fillets not less than 19 mm x 19 mm attached so as to prevent mortar runs and to produce smooth straight chamfers at all sharp edges of the concrete.

Form fasteners shall be removable without chipping, spalling, heating or otherwise damaging the concrete surface. Form ties shall be removed to a depth of at least 25 mm below the surface of the concrete.

The inside surfaces of forms shall be cleaned of all dirt, mortar and foreign material. Forms shall be thoroughly coated with form oil prior to use.

Forms shall not be stripped until at least 40 hours after placing concrete, except soffit forms and supports shall not be released or removed until at least 10 days after placing concrete.

Anchorage and embedded items shall be placed and rigidly secured at their planned locations prior to placing concrete.

Reglets or embedded flashing shall be installed on concrete forms before the concrete is placed.

Redwood dividers shall have 4 mm x 89 mm galvanized nails partially driven into both vertical faces at 450 mm on centers.

**Vapor barrier.--**Vapor barrier shall be installed in conformance with the manufacturer's recommendations and shall be protected with a 75 mm layer of clean uncompacted sand cover.

Unless otherwise shown on the plans, vapor barrier shall be placed under portions of the floor slab scheduled to receive finish flooring.

**Placing reinforcing steel.--**Reinforcing steel bars shall be accurately placed to the dimensions shown on the plans.

Bar reinforcement conforming to ASTM Designation: A 615/A 615M, Grade 60 [420], or A 706//A 706M shall be lapped at least 45 diameters.

Bars shall be firmly and securely held in position by means of wiring and approved bar supports. The spacing of supports and ties shall prevent displacement of the reinforcing or crushing of supports.

Tie wire shall be clear of concrete formwork and concrete surfaces.

All reinforcing steel shall be in place and inspected before concrete placement begins. Placing of bars on fresh layers of concrete will not be permitted.

Within areas where epoxy-coated reinforcement is required, tie wire and bar chairs or other metallic devices used to secure or support the reinforcement shall be plastic-coated or epoxy-coated to prevent corrosion of the devices or damage to the coated reinforcement.

**Ground bar.--**A continuous reinforcing steel bar shall be installed in the building foundation at the location indicated on the plans for the electrical ground bar. The use of epoxy coated reinforcing bar is not permitted. The end of the ground bar shall extend beyond the concrete surface and shall be protected from damage by construction operations.

## **PLACING CONCRETE**

**General.--**Concrete shall be placed and consolidated by means of internal vibrators to form dense, homogeneous concrete free of voids and rock pockets.

Forms and subgrade shall be thoroughly moistened with water immediately before placing concrete.

Concrete shall be placed as nearly as possible to its final location and the use of vibrators for extensive shifting of the concrete will not be permitted.

Concrete shall be deposited and consolidated in a continuous operation within limits of construction joints, until the placing of the panel or section is completed.

When concrete is to be placed in large areas requiring more than two pours, concrete shall be placed in alternate long strips between construction joints and the final slab infilled.

Vibrators used to consolidate concrete containing epoxy-coated bar reinforcement shall have a resilient covering to prevent damage to such reinforcement.

## FINISHING CONCRETE SURFACES

**Finishing unformed surfaces.--**Slabs shall be placed full thickness to finish elevation and leveled to screeds by use of long straightedges. The screeds shall be set to grade at approximately 1.8 meter centers. After leveling, screeds shall be removed and the surface shall be floated with wooden floats.

The floated surface shall be trowelled with steel trowels. Troweling shall form a dense, smooth and true finish. Walkways, pedestrian ramps, stairs and outdoor slabs for pedestrian traffic shall be given a non-slip broom finish unless a different finish is called for on the plans or in these special provisions.

The application of cement dust coat will not be permitted.

Steel trowel finish and broom finish will not be required for slabs to receive exposed aggregate finish nor for slabs to be covered with ceramic tile.

Concrete floor surfaces to receive ceramic tile shall be floated to grade and then, before final set of the concrete, the floated surfaces shall be roughened with stiff bristled brushes or rakes.

Finished surfaces of floor slabs shall not deviate more than 3 mm from the lower edge of a 3-meter long straight edge.

**Finishing formed surfaces.--**Formed concrete surfaces shall be finished by filling holes or depressions in the surface, repairing all rock pockets, and removing fins. All surfaces of formed concrete exposed to view shall have stains and discolorations removed, unsightly bulges removed, and all areas which do not exhibit the required smooth, even surface of uniform texture and appearance shall be sanded with power sanders or other approved abrasive means until smooth, even surfaces of uniform texture and appearance are obtained.

Cement mortar, patching and finishing materials used to finish exposed surfaces of concrete shall closely match the color of surrounding surfaces.

## CURING CONCRETE

**General.--**Freshly placed concrete shall be protected from premature drying and excessive cold or hot temperatures.

Initial curing of floor slabs shall start as soon as free water has disappeared from the concrete surface. The concrete shall be kept continuously wet by application of water for not less than 7 days after the concrete has been placed.

Cotton mats, rugs, carpets, or sand blankets may be used as a curing medium to retain the moisture during the curing period. Curing materials that will stain or discolor concrete shall not be used on surfaces exposed to view.

Prior to placing the curing medium, the entire surface of the concrete shall be kept damp by applying water with a nozzle that so atomizes the flow that a mist and not a spray is formed, until the surface of the concrete is covered with the curing medium. At the expiration of the curing period, the concrete surfaces shall be cleared of all curing mediums.

Concrete surfaces, other than floor slabs, shall be kept moist for a period of at least 5 days by leaving the forms in place or by covering the exposed surfaces using moist rugs, cotton mats or other curing materials approved by the Engineer.

Concrete curbs, sidewalks, collars, and gutter depressions may be cured with a curing compound.

## PROTECTING CONCRETE

**General.--**Concrete shall not be placed on frozen or frost covered surfaces.

Concrete shall be protected from damage due to rain, freezing or inclement weather, and shall be maintained at a temperature of not less than 4°C for 72 hours. When required by the Engineer, the Contractor shall provide a written outline of his proposed methods of protecting concrete.

Vehicles, equipment, or concentrated loads weighing more than 140 kg individually and material stockpiles weighing more than 240 kg/m<sup>2</sup> will not be permitted on the concrete within 10 calendar days after placing.



## **12-3.02 DRILL AND BOND DOWELS**

### **PART 1.- GENERAL**

#### **SUMMARY**

**Scope.--**This work shall consist of drilling holes in existing concrete and installing and bonding bar reinforcing steel dowels into such drilled holes in existing concrete in accordance with the details shown on the plans and these special provisions.

### **PART 2.- PRODUCTS**

#### **Bonding material**

The bonding material shall be magnesium phosphate concrete, either single component (water activated) or dual component (with a prepackaged liquid activator), as approved by the Engineer.

#### **Dowels**

Dowels shall be bar reinforcing steel, as specified under "Cast-In-Place Concrete" in Section 12-3, "Concrete and Reinforcement," of these special provisions.

### **PART 3.- EXECUTION**

**INSTALLATION.--**The holes shall be drilled by methods that will not shatter or damage the concrete adjacent to the holes. The diameter of drilled holes shall be 13 mm larger than the nominal diameter of the dowels unless otherwise shown on the plans.

Immediately prior to placing the dowels, the holes shall be cleaned of dust and other deleterious materials, and the holes shall be dry.

Sufficient bonding material shall be placed in the hole so that no voids remain after the dowels are inserted.

Dowels which fail to bond or are damaged before new concrete is placed shall be removed and replaced.

Magnesium phosphate concrete shall be formulated for minimum initial set time of 15 minutes and minimum final set time of 25 minutes at 21°C. The materials, prior to use, shall be stored in a cool, dry environment.

Mix water used with water activated material shall be free from oil and impurities and contain not more than 2000 parts per million as Cl nor more than 1500 parts per million of sulfate as SO<sub>4</sub>.

The quantity of water for single component type or liquid activator for dual component type to be blended with the dry component, shall be within the limits recommended by the manufacturer and shall be the least amount required to produce a pourable batter.

Magnesium phosphate concrete shall not be mixed in containers or worked with tools containing zinc, cadmium, aluminum, or copper metals.

The surface of any dowel coated with zinc or cadmium shall be coated with a colored lacquer before installation of the dowel. The lacquer shall be allowed to dry thoroughly before embedment of said dowels.

## **12-3.03 EPOXY GROUT**

### **PART 1.- GENERAL**

#### **SUMMARY**

**Scope.--**This work shall consist of packing post pockets with epoxy grout in accordance with the details shown on the plans and these special provisions.

### **PART 2.- PRODUCTS**

#### **Grout**

Epoxy grout shall consist of a mixture of epoxy binder and aggregate. The epoxy binder shall conform to the provisions in Sections 95-1, "General," and 95-2.01, "Binder (Adhesive) Epoxy Resin Base," of the Standard Specifications, and to the requirements in this section.

## **Aggregate**

Aggregate shall conform to the requirements for aggregate for portland cement concrete in Section 90, "Portland Cement Concrete," of the Standard Specifications. The amount of moisture in the aggregate when mixed with binder shall not exceed 0.50-percent, as determined by California Test 226.

The aggregate size and proportions and the exact proportions of binder to aggregate shall be in conformance with the location, temperature and dimensions of the work. The aggregate size and proportions will be fine aggregate, as provided for typical epoxy grout and shall be of such character that it will be possible to produce a workable epoxy grout.

## **PART 3.- EXECUTION**

**Installation.-** The minimum temperature of the epoxy grout after mixing shall be 10°C, except that when the ambient temperature is below 10°C, the minimum temperature of the concrete or grout shall be 18°C.

The temperature of the aggregate at the time of mixing shall not be more than 32°C.

The mix proportions of epoxy grout shall be one part of binder to approximately 4 parts of aggregate, by volume.

In addition to the provisions in Sections 95-1.03, "Packaging, Labeling and Storing," and 95-1.04, "Directions for Use," of the Standard Specifications, the following shall apply:

The components may be delivered in containers larger than 20 L in volume provided the containers have removable type lids with seals that prevent leakage. Containers previously opened and containing unused materials shall be resealed and stored in a protected environment to prevent the intrusion of water or other contaminants. The labels on the containers shall be kept intact and clean to permit positive identification of the contents.

The components may be delivered in the tanks of 2-component metering, mixing, and application equipment having removable type lids with seals when the equipment has previously been approved for use.

Immediately before withdrawing material from the container or application by the 2-component equipment, each component shall be thoroughly mixed in the container or tank by power driven paddles or devices.

Each container shall be labeled as required in Section 95-1.03, "Packaging, Labeling and Storing," of the Standard Specifications. Each delivery of material in the tanks of 2-component equipment shall be accompanied by a ticket containing all the label data listed in Section 95-1.03, "Packaging, Labeling and Storing," of the Standard Specifications.

Prior to placing epoxy grout, the holes to be filled shall be free of all dust, loose particles and deleterious materials by pressure jetting with air or by other suitable means.

## **SECTION 12-4. MASONRY**

### **12-4.01 CONCRETE MASONRY UNITS**

#### **PART 1.- GENERAL**

#### **SUMMARY**

**Scope.--**This work shall consist of constructing reinforced hollow concrete masonry units in accordance with the details shown on the plans and these special provisions.

**Related work.--**Water repellent coating shall be applied in accordance with the requirements specified under "Water Repellent Coating" in Section 12-7, "Thermal and Moisture Protection," of these special provisions.

## **PERFORMANCE REQUIREMENTS**

**Unit Strength.**--Provide masonry units that develop the following installed compressive strengths ( $f_m$ ) at 28 days:

Based on net area  $f_m = 10.34 \text{ MPa}$

## **SUBMITTALS**

**Product data.**--Manufacturer's descriptive data for each type of masonry unit, accessory, and other manufactured products shall be submitted for approval.

## **QUALITY ASSURANCE**

**Single source responsibility.**--Exposed masonry units of uniform color and texture shall be obtained from one manufacturer for each different product required for each continuous surface or visually related surfaces.

**Certificates of Compliance.**--Certificate of Compliance shall be furnished for masonry units, aggregate for grout and transit mixed grout in accordance with the requirements specified in Section 6-1.07, "Certificates of Compliance," of the Standard Specifications.

## **DELIVERY, HANDLING AND STORAGE**

**Delivery.**--Masonry materials shall be delivered to the project in an undamaged condition.

**Storage and handling.**--Masonry units shall be stored and handled in order to prevent deterioration or damage due to moisture, temperature changes, contamination, corrosion or other causes.

## **PART 2.- PRODUCTS**

### **CONCRETE MASONRY UNITS**

#### **Concrete masonry units**

Concrete masonry units shall be nominal size, color and architectural finish as shown on plans; hollow load bearing, light weight or medium weight, Grade N, Type II, conforming to ASTM Designation: C 90; standard or open ended masonry units.

### **GROUT MATERIALS**

#### **Cement**

Cement for grout shall be Type II portland cement conforming to ASTM Designation: C 150 with maximum 15 percent Class N, F, or C mineral admixture conforming to ASTM Designation: C 618 except that the loss on ignition shall not exceed 4 percent; or Type IP(MS) blended hydraulic cement conforming to ASTM Designation: C 595.

#### **Aggregate**

Aggregate for grout shall conform to ASTM Designation: C 404, except 100 percent of the coarse aggregate shall pass the 9.5 mm sieve. Soundness loss shall not exceed 10 percent as determined by California Test 214.

#### **Lime**

Lime shall conform to ASTM Designation: C 207, Type S.

**Premixed grout**

A premixed packaged blend of cement, lime, and sand, with or without color, that requires only water to prepare for use as grout may be furnished. Packages of premix shall bear the manufacturer's name, brand, contents, weight, and color identification.

**Transit mixed grout**

Transit mixed grout shall conform to ASTM Designation: C 94, except aggregate shall be as specified herein for aggregate for grout. The minimum compressive strength shall be 17236 kPa at 28 days when tested in accordance with ASTM Designation: C 39. Admixtures, if used, shall conform to ASTM Designation: C 494, Types A, E or F and shall not contain chlorides.

**REINFORCEMENT, TIES AND ANCHORING DEVICES****Bar reinforcement**

Bar reinforcement shall conform to ASTM Designation: A 615/A 615 M, Grade 60 [420], or ASTM Designation: A 706/A 706 M.

**Dry pack**

Dry pack to set items into masonry shall be one part portland cement to not over 3 parts of clean sand and with a minimum amount of water for hydration and packing.

**PROPORTIONING GROUT**

**General.**--Grout, except transit mixed and packaged premix grout, shall be proportioned by loose volume and shall have one part cement, not more than 1/10 part hydrated lime, 2 1/4 to 3 parts sand aggregate, and not more than 2 parts gravel aggregate.

Aggregate shall be measured in a damp loose condition.

Grout shall be mixed with sufficient water to produce a mix consistency suitable for pumping without segregation. Slump shall not exceed 229 mm.

**PART 3.- EXECUTION****CONSTRUCTION**

**General.**--Construction will comply with Section 2104, "Construction," of the CBC. Tolerances specified in Section 2104 shall be in affect unless otherwise shown on the plans.

Masonry shall not be erected when the ambient air temperature is below 5° C.

Surfaces of masonry erected when the ambient air temperature exceeds 38° C. shall be kept moist with water for a period of not less than 24 hours. Water shall be uniformly applied with a fog spray at the intervals required to keep the surfaces moist but not to exceed 3 hours unless otherwise approved by the Engineer.

All anchors, bolts, dowels, reglets and other miscellaneous items to be cast into the wall, shall be firmly secured in place before grout is poured.

**Laying masonry units.**--Concrete masonry units shall be laid dry.

Where masonry unit cutting is necessary, all cuts shall be made with a masonry saw to neat and true lines. Blocks with excessive cracking or chipping of the finished surfaces exposed to view will not be acceptable.

**Bar reinforcement.**--Bar reinforcement shall be accurately positioned in the center of the cell and securely held in position with either wire ties or spacing devices near the ends of bars and at intervals not exceeding 192 bar diameters. Wire shall be 16-gage or heavier. Wooden, aluminum, or plastic spacing devices shall not be used. Tolerances for the placement of vertical reinforcement in walls and flexural elements shall be  $\pm 12$  mm. Tolerance for longitudinal reinforcement in walls shall be  $\pm 50$  mm.

## **GROUTING**

**General.**--All cells shall be filled solidly with grout. All grout in the cells shall be consolidated at the time of placement by vibrating and reconsolidated after excess moisture has been absorbed but before plasticity is lost. Slicing with a trowel is not acceptable.

## **CLEANING AND PROTECTING MASONRY**

**General.**--Splashes, stains or spots on the faces of the masonry exposed to view shall be removed. Completed masonry shall be protected from freezing for a period of at least 5 days.

## **SECTION 12-5. METALS**

### **12-5.01 STRUCTURAL STEEL FOR BUILDINGS**

#### **PART 1.- GENERAL**

##### **SUMMARY**

**Scope.**--This work shall consist of fabricating, assembling, furnishing and erecting structural steel in accordance with the details shown on the plans and these special provisions.

Structural steel consists of:

**Source quality control.**--Materials and fabrication procedures are subject to inspection and tests in mill, shop and field, conducted by the Engineer or a qualified inspection agency. The Contractor or fabricator shall provide access to the Engineer or testing agency to places where the structural steel work is being fabricated or produced so that the required inspection and testing can be accomplished. Such inspections and tests will not relieve the Contractor of responsibility for providing materials and fabrication procedures in compliance with specified requirements. The testing agency may inspect the structural steel at the plant before shipment; however, the Engineer reserves the right, at any time before final acceptance to reject the material that does not conform to the contract requirements.

##### **REFERENCES**

**General.**--Structural steel shall be fabricated, assembled and erected in accordance with American Institute of Steel Construction (AISC), "Steel Construction Manual."

Welding shall be in accordance with American Welding Society (AWS) D1.1, "Structural Welding Code - Steel."

##### **SUBMITTALS**

**Product data.**--Product data for items to be incorporated into the work, including structural steel, high strength bolts, nuts and washers and alternative connectors, shall be submitted for approval.

**Working drawings.**--Working drawings and calculations shall be submitted for approval.

Working drawings shall show any changes proposed in the work, details of connections and joints exposed to the weather, details for connections not dimensioned on the plans, the sequence of shop and field assembly and erection, welding sequences and procedures. If required, the location of butt welded splices on a layout drawing of the entire structure, and the location and details of any temporary supports that are to be used.

Calculations and working drawings for falsework to be used for the erection of structural steel shall be submitted for approval. The falsework shall be designed and constructed to provide the necessary rigidity and to support loads which will be applied. Working drawings and design calculations shall be stamped and signed by an engineer who is registered as a Civil or Structural Engineer in the State of California. The expiration date of the registration shall be shown.

## **CLOSEOUT SUBMITTALS**

**Final drawings.**--At the completion of each building on the contract, one set of reduced prints on 27 kg (minimum) bond paper, 280 mm x 432 mm in size, of the corrected original tracings of all approved drawings for each building shall be furnished to the Engineer. An index prepared specifically for the drawings for each building containing sheet numbers and titles shall be included on the first reduced print in the set for each building. Reduced prints for each building shall be arranged in the order of drawing numbers shown in the index.

The edge of the corrected original tracing image shall be clearly visible and visually parallel with the edges of the page. A clear, legible symbol shall be provided on the upper left side of each page to show the amount of reduction and a horizontal and vertical scale shall be provided on each reduced print to facilitate enlargement to original scale.

## **QUALITY ASSURANCE**

**Qualifications for welding.**--A certified copy of qualification test record for welders shall be submitted to the Engineer at the jobsite. Descriptive data for equipment for field welding structural steel, including type and electric power requirements, shall be submitted for approval.

**Certificates of Compliance.**--Certificate of Compliance shall be furnished for structural steel products in accordance with the requirements specified in Section 6-1.07, "Certificates of Compliance," of the Standard Specifications. Certificate of Compliance shall include mill test certificates for each heat number used in the work.

## **DELIVERY, HANDLING AND STORAGE**

Structural materials shall be loaded, transported, unloaded and stored so that it is kept clean and undamaged. Material shall be stored above ground on platforms, skids, or other supports. Covers and protection shall be provided to protect the materials from corrosion.

Anchorage and anchor bolts, which are to be embedded in concrete or masonry, shall be delivered in ample time to not delay the work.

## **PART 2.- PRODUCTS**

### **MATERIALS**

#### **Steel bars, plates and shapes**

Steel bars, plates and shapes shall conform to ASTM Designation: A 36/A 36M or A 572/A 572M, Grade 50 [345].

#### **Pipe**

Pipe shall conform to ASTM Designation: A 53, standard weight, unless otherwise shown on the plans.

#### **Steel tubing**

Steel tubing shall conform to ASTM Designation: A 500, Grade B, or A 501.

#### **Stud connectors**

Stud connectors shall conform to ASTM Designation: A 108, Grades 1018 through 1020, cold drawn, either semi- or fully killed.

#### **Anchor bolts, nuts and washers**

Nonheaded anchor bolts shall conform to ASTM Designation: A 36/A 36M, with a minimum hook length of 6.2 diameters.

Headed anchor bolts shall conform to ASTM Designation: A 307.

Nuts shall conform to ASTM Designation: A 563M, Grade A.

Washers for anchor bolts shall be commercial quality.

**Machine bolts, nuts and washers**

Machine bolts and nuts shall conform to ASTM Designation: A 307.

Washers for machine bolts shall be commercial quality.

**High strength (HS) bolts, nuts and washers**

High strength (HS) bolts, nuts and washers shall conform to ASTM Designation: A 325M.

**FABRICATION**

**Shop fabrication and assembly.**--Workmanship and finish shall be equal to the best general practice in modern shops.

Cuts shall not deviate more than 2 mm from the intended line. Roughness, notches or gouges shall be removed.

Bearing stiffeners at points of loading shall be square with the web and shall have at least 75 percent of the stiffener in contact with the flanges.

Finished members shall be true to line, shall have square corners and smooth bends and shall be free from twists, kinks, warps, dents and open joints.

Exposed edges and ends of metal shall be dressed smooth, with no sharp edges and with corners slightly rounded.

**Stud connectors.**--Steel surfaces shall be prepared as recommended by the manufacturer of the stud connectors. Stud connectors shall be welded to the flanges of beams or girders as shown on the plans. Automatic end welding of headed stud connectors shall be in accordance with the manufacturer's instructions.

**Connections.**--Abutting surfaces at connections shall be clean.

Cutting and welding at the jobsite will not be allowed except as shown on the approved drawings or specifically approved by the Engineer.

Finished holes for bolts shall be cylindrical and perpendicular to the plane of the connection. Sub-punched and sub-drilled holes shall be 6 mm smaller in diameter than the diameter specified for the finished hole.

**Holes for other work.**--Holes for securing other work to structural steel and passage of other work through steel framing members shall be as shown on the approved drawings.

Threaded nuts or specialty items for securing other work to steel members shall be as shown on the approved drawings.

Holes shall be cut, drilled or punched perpendicular to metal surfaces. Holes shall not be flame cut or enlarged by burning. Holes are to be drilled in bearing plates.

**SHOP PAINTING**

**General.**--Structural steel members, except those to receive sprayed-fireproofing, shall be painted.

Cleaning and coating shall be in accordance with the requirements specified for the particular type of substrate material under "Painting" in Section 12-9, "Finishes," of these special provisions.

**PART 3.- EXECUTION**

**ERECTION AND ASSEMBLY**

**Field splices.**--Field splices shall be made only at the locations shown on approved working drawings.

The parts shall be accurately assembled in their final position as shown on the plans and in true alignment with related and adjoining work before final fastening.

All parts shall be supported adequately and at locations to provide a vibration free, rigid, and secure installation.

Mortar shall be solidly packed between bearing surfaces and base or bearing plates to ensure that no voids remain. Exposed surfaces shall be finished and allowed to cure.

## FIELD PAINTING

**Touch-up painting.**--After erection, the Contractor shall clean field welds, bolted connections, and abraded areas of shop paint and apply the same materials as applied for shop painting.

Surfaces that are scheduled to receive finish coats shall be painted with a second prime coat and finish coats in accordance with the requirements specified under "Painting" in Section 12-9.

## QUALITY CONTROL

**Testing and inspection.**--Ultrasonic examination shall be performed by the Contractor on at least 50 percent of all full penetration butt-welded splices in accordance with the requirements of AWS D1.1 and these special provisions.

Welding procedures and methods shall be subject to inspection for conformance with AWS D1.1.

Butt welds shall be tested in accordance with AWS D1.1, Chapter 6, Part C, Ultrasonic Testing of Groove Welds.

Examination, reporting and disposition of tests shall be in accordance with the provisions of 6.12, AWS D1.1.

In addition to ultrasonic examinations by the Contractor, welds may be subject to inspection or non-destructive testing by the Engineer.

When additional inspection or non-destructive testing is required by the Engineer, the Contractor shall provide sufficient access facilities in the shop and at the jobsite to permit the Engineer or his agent to perform such inspection and testing.

The Contractor shall correct all deficiencies in the structural steel work which inspections and laboratory test reports have indicated to be not in compliance with these special provisions. Additional tests shall be performed by the Contractor at his expense to reconfirm any non-compliance of original work, and to show compliance of the corrected work.

## 12-5.02 OPEN WEB STEEL JOISTS

### PART 1.- GENERAL

**Scope.**--This work shall consist of designing, fabricating, furnishing and erecting pre-engineered, factory fabricated steel joists and accessories in accordance with the detail shown on the plans and these special provisions.

### SUBMITTALS

**Product data.**--Manufacturers descriptive data, layout and anchorage details, quality control manual, welder qualifications, and installation instructions shall be submitted for approval.

**Working drawings.**--Complete working drawings and design calculations for the pre-engineered steel joists, permanent bracing, continuity angles and connection details shall be submitted for approval. Submittals shall be approved prior to the start of fabrication.

Working drawings shall show the size and shape of the truss members and temporary and permanent bracing members. Joint and connection details shall be shown.

Working drawings shall include a location plan which shows the location and identification of each steel joist.

Calculations for the design of the steel joists, bracing and connections shall include a list of applied loads and load combinations with the resulting member forces and member stresses. Steel joists and connections shall be designed for the chord forces shown on the plans.

Design calculations shall be stamped and signed by an engineer who is registered as a Civil or Structural Engineer in the State of California. The expiration date of the registration shall be shown.

If the design calculations contain or consist of computerized or tabulated calculations, the values pertaining to the design shall be identified, described or indexed in such a manner that a design review can be performed.

### QUALITY ASSURANCE

**Manufacturer Qualification.**--Steel joists shall be manufactured by a firm experienced in manufacturing steel joists similar to those specified and with a record of successful in-service performance. Manufacturer shall be



certified by the Steel Joist Institute (SJI) to manufacture joists complying with SJI standard specifications and load tables.

**Codes and Standards.**--Steel joists and permanent bracing shall be designed for the loads shown on the plans and other applied loads, including fire sprinkler systems. The design shall be in accordance with the requirements of the CBC and the SJI "Standard Specifications, Load Tables and Weight Tables for Steel Joists and Joist Girders" (SJI-01).

**Certificates of Compliance.**--Certificates of Compliance shall be furnished for steel joists in accordance with the requirements specified in Section 6-1.07, "Certificates of Compliance," of the Standard Specifications.

**Identification.**--Each joist shall be stamped or marked with a location identification mark or symbol and with the name and address of the manufacturer.

## **DELIVERY, STORAGE AND HANDLING**

**General.**--Steel joists shall be delivered to the site in undamaged condition and stored off the ground in a well drained location, protected from damage, and easily accessible for inspection and handling. Covers shall be provided to protect the materials from corrosion.

Steel joists shall be handled in such a manner as to prevent damage due to bending and warping.

## **PART 2.- PRODUCTS**

### **Open web steel joists**

Open web steel joists shall conform to SJI-01, K-Series. Joists shall be designed to support the loads shown on the plans.

### **Bearing plates, fasteners and accessories**

Bearing plates, fasteners and accessories shall be as shown on the approved working drawings.

### **Anchors**

Anchors shall conform to the requirements in "Building Miscellaneous Metal" specified under Section 12-5, "Metals," of these special provisions.

## **FABRICATION**

**General.**--Workmanship and finish shall be equal to the best general practice in modern steel fabrication shops. Construction shall conform to the SJI Code of Standard Practice.

Camber, if required by the design, shall be built into the joists.

## **CLEANING AND SHOP PAINTING**

**Painting.**--Immediately after cleaning, surfaces of steel joists shall receive one coat of shop applied primer meeting the requirements of the Society for Protective Coatings, SSPC-Paint 15. The coating shall be applied and cured in accordance with the manufacturer's printed instructions.

## **PART 3.- EXECUTION**

### **EXAMINATION**

**General.**—The Contractor shall examine supporting substrates, embedded bearing plates, and abutting structural framing for compliance with requirements for installation tolerances and other conditions affecting performance. Proceed with installation only after unsatisfactory conditions have been corrected.

## **ERECTION**

**General.**--Installation of joists shall be in accordance with the approved working drawings. Steel joists and bracing members shall be accurately cut to provide tightly fitted joints and connections.

Joists shall be handled in a manner to avoid damage. Damaged joists shall be removed from the site, except when field repair is approved by the Engineer and such repairs are satisfactorily made in accordance with the manufacturer's recommendations.

**Installation.**--Steel joists shall be erected plumb and true and shall be secured rigidly in place in accordance with the approved working drawings. Joists shall not be field cut or otherwise altered without the written approval of the Engineer.

Temporary bracing shall be installed during erection to hold the joists plumb and true and in a safe position until sufficient permanent construction is in place to provide full stability.

Bearing plates shall have full bearing after the supporting members have been plumbed and properly positioned, prior to placing superimposed loads.

Connectors, fasteners and other hardware accessories shall be coordinated for placement in the proper locations and positions.

Joist bridging and anchoring shall be secured in place prior to the application of any construction loads. Any temporary loads shall be distributed so that the design carrying capacity of any joist is not exceeded. Loads shall not be applied to bridging during construction or in the completed work.

All permanent bracing shall be secured in place before any sustained permanent loads are applied to the joist system.

Welding shall be by the tungsten inert gas arc welding method or the consumable electrode inert gas method. Welding processes that require the use of flux are not permitted.

All welds shall conform to the requirements of Section 8.15, "Quality of Welds," of the American Welding Society publication No. AWS D 1.1, "Structural Welding Code."

Exposed welds shall be ground smooth and flush.

## **CLEANING AND PAINTING**

**General.**—After erection, abraded, corroded, and field welded areas shall be cleaned and touched up with the same type of paint used in the shop painting.

Coatings shall conform to the requirements in "Steel and other Ferrous Metals, Interior Exposure" specified under Section 12-9, "Painting." Steel surfaces shall be prepared in accordance with the manufacturer's printed instructions. The final finish color shall be approved by the Engineer.

## **12-5.03 METAL DECK**

### **PART 1.- GENERAL**

#### **SUMMARY**

**Scope.**--This work shall consist of furnishing and installing metal deck in accordance with the details shown on the plans and these special provisions.

Metal deck includes ribbed sheet steel decking units, bent plates, accessories, fasteners and such other components, not mentioned, but required for a rigid, secure and complete installation.

#### **REFERENCES**

**General.**--The design, fabrication and erection of metal deck shall conform to the applicable requirements of the American Iron and Steel Institute (AISI) publication, "Specifications for the Design of Light Gauge Cold Formed Steel Structural Members," and the applicable Steel Deck Institute Design Manual and these special provisions.

Welding shall be in accordance with American Welding Society (AWS) D1.3, "Structural Welding Code - Sheet Steel."

## **SUBMITTALS**

**Product data.**--Manufacturer's descriptive data for each type of deck and accessories shall be submitted for approval.

**Working drawings.**--Working drawings showing complete erection layouts, details, dimensions, deck section properties shall be submitted for approval. Drawings shall show types and gages, fastening methods, including the location, type and sequence of connections, sump pans, cut openings, surface finishes and temporary supports or bracing.

The metal deck supplier shall submit a fastening schedule and calculations stamped by an engineer who is registered as a Civil or Structural Engineer in the State of California showing that the metal roof panels, clips, and fasteners conform to the span and design loads shown on the plans and the wind uplift requirements of the CBC.

## **QUALITY ASSURANCE**

**Qualification of field welding.**--Welding processes and welding operators shall be qualified in accordance with "Welder Qualification," procedures in American Welding Society (AWS) D1.1, "Structural Welding Code - Steel."

Welding decking in place is subject to inspection and testing. Defective work shall be removed and replaced with acceptable work.

**Certificates of Compliance.**--Certificates of Compliance shall be furnished for the metal decking in accordance with the requirements specified in Section 6-1.07, "Certificates of Compliance," of the Standard Specifications.

## **DELIVERY, HANDLING AND STORAGE**

**General.**--Metal deck units and accessories shall be transported, stored and erected in a manner that will prevent corrosion, distortion or other damage.

Deck units shall be stored off the ground with one end elevated to provide drainage.

## **PART 2.- PRODUCTS**

**MANUFACTURERS.**--Acceptable manufacturers shall be; Verco Manufacturing Co.; BHP Co.; or equal.

## **MATERIALS**

### **Deck units**

Deck units, closures and plates shall be fabricated from galvanized sheet steel conforming to ASTM Designation: A 653/A 653M, Grade 33 [230].

Galvanizing shall conform to the requirements of ASTM Designation: A 924/A 924M, G60 [Z180].

### **Miscellaneous steel shapes**

Miscellaneous steel shapes shall conform to ASTM Designation: A 36/A 36M.

### **Anchor clips, vent clips, flashing, saddle plates, flexible closure strips and other accessories**

Anchor clips, vent clips, flashing, saddle plates, flexible closure strips and other accessories shall be as recommended by the decking manufacturer.

## **FABRICATION**

**General.**--Deck units shall be formed to span 3 or more supports, with flush, telescoped or nested 50 mm laps at ends and interlocking or nested side laps unless otherwise shown on the plans.

Deck units shall conform to the configurations, metal thickness, depth and width and section properties shown on the plans.

End bearing shall be not less than 38 mm.

**Metal closure strips.**--Metal closure strips for opening between deck units and other construction shall be fabricated from the same gage and material as the adjacent deck units. Strips shall be formed to provide tight-fitting closures at end of cells or flutes and sides of decking.

### **PART 3.- EXECUTION**

#### **INSTALLATION**

**General.**--Deck units and accessories shall be installed in accordance with the manufacturer's recommendations and approved drawings and these special provisions.

Units shall be placed on supporting steel framework, adjusted in place and properly aligned before being permanently fastened. Ends of units shall have positive bearing over structural supports.

Cutting and fitting shall present a neat and true appearance with exposed burrs removed. Openings through the decking shall be cut square and shall be reinforced as recommended by the decking manufacturer.

The metal deck shall not be used as a working platform before deck units are fastened in place. Supplies, equipment or other loads shall not be stored on the deck. Mechanical equipment or other loads shall not be hung from metal roof decking.

**Welding.**--Welding shall conform to AWS requirements (D1.1 and D1.3) and procedures for manual shielded metal arc welding, appearance and quality of welds, and methods used in correcting welding work.

Welding washers shall be used where recommended by the manufacturer.

**Fastening roof deck units.**--Roof deck units shall be fastened to supporting steel members as shown on the structural plans.

**Fastening side laps.**--Side laps of adjacent deck units shall be fastened as shown on the plans.

**Field painting.**--Immediately following erection, field welds, bolted connections and abraded areas shall be cleaned with a wire brush.

Galvanized surfaces shall be touched-up with galvanizing repair paint recommended by the manufacturer.

### **12-5.04 COLD FORMED METAL FRAMING**

#### **PART 1.- GENERAL**

##### **SUMMARY**

**Scope.**--This work shall consist of furnishing and installing cold formed metal framing, including load-bearing and non-bearing steel studs, and "C"-shaped steel joists and rafters, in accordance with the details shown on the plans and these special provisions.

##### **SYSTEM DESCRIPTION**

**Loadings.**--Components shall be sized to withstand the design loads shown on the plans.

Wall system shall be designed to provide for movement of components without damage, failure of joint seals, undue stress on fasteners, or other detrimental effects when subject to seasonal or cyclical day/night temperature range.

Wall system design shall accommodate construction tolerance, deflection of building structural members, and clearances of intended openings.

##### **REFERENCES**

**Component design.**--Structural properties of studs and joists shall be computed in accordance with American Iron and Steel Institute (AISI), "Specification for Designing of Cold-Formed Steel Structural Members."

**Welding.**--Welding shall be in accordance with American Welding Society (AWS) D1.3, "Structural Welding Code - Sheet Steel."

Welders shall be qualified in accordance with "Welder Qualification," procedures of AWS D1.1, "Structural Welding Code-Steel."

## **SUBMITTALS**

**Product data.**--Manufacturer's descriptive data and installation instructions for each item of cold-formed metal framing and accessories shall be submitted for approval.

Installation instructions shall include instructions for securing studs to tracks and other framing connections.

**Working drawings.**--Working drawings and calculations for cold formed metal framing components not fully dimensioned in manufacturer's descriptive data shall be submitted for approval.

Working drawings shall include framing members showing size and gage designations, number, type, location and spacing. Working drawings shall include supplemental strapping, bracing, splices, bridging, accessories, and details required for proper installation.

The cold formed metal framing supplier shall submit drawings and calculations stamped by an Engineer who is registered as a Civil or Structural Engineer in the State of California showing that the metal framing and fasteners comply with seismic and wind uplift requirements of the CBC.

## **QUALITY ASSURANCE**

**Fire-rated assemblies.**--Where cold formed metal framing units are components of assemblies indicated to be fire-rated, provide units which have been approved for the rating indicated on the plans.

## **DELIVERY, STORAGE AND HANDLING**

**General.**--Cold formed metal framing components shall be protected from rusting and damage. Components shall be delivered to the jobsite in manufacturer's unopened containers or bundles, fully identified with name, brand, type and grade. Components shall be stored off ground in a dry ventilated space.

## **PART 2.- PRODUCTS**

### **COLD FORMED METAL FRAMING**

#### **Steel studs, joists and rafters**

Load-bearing studs shall be formed to channel shape, punched web, and knurled faces, conforming to ASTM Designation: A 653/A 653M, Grade 50 [340]. Studs shall be 1.52 mm (16-gage) minimum thickness and size as shown on the drawings.

Joists, rafters, and other framing components, 1.21 mm (18-gage) or lighter, shall be fabricated of commercial quality galvanized steel sheets; conforming to ASTM Designation: A 653/A 653M, Grade 33 [230].

#### **Steel Track**

Track shall be formed steel, channel shape, and same width as studs; solid web; not less than 1.21 mm (18-gage) thickness.

## **ACCESSORIES**

#### **Fasteners**

Fasteners shall be hot-dipped galvanized, self-drilling, self-tapping screws, or bolts, nuts and washers.

#### **Anchorage**

Anchorage shall be ICBO approved for the purpose intended, integral stud type, powder driven or drilled expansion bolts.

## **FINISHES**

### **Studs, track and headers**

Studs, tracks and headers shall be hot-dipped galvanized to conform to ASTM Designation: A 653M, G60.

### **Miscellaneous metal parts**

Miscellaneous parts, including, bracing, furring, plates, gussets, and bridging, shall be hot dipped galvanized to not less than 381 kilograms per square meter.

## **FABRICATION**

**General.**--Cold formed metal framing components shall be fabricated in place or prefabricated into panels to the maximum extent possible prior to erection. Panels shall be fabricated plumb, square, true to line and braced against racking with joints welded. Lifting of prefabricated panels shall be performed in a manner to prevent damage or distortion.

Panels shall be fabricated in jig or templates to hold members in proper alignment and position to assure accurate placement.

**Fastenings.**--Components shall be fastened by shop welding, bolting or screw fasteners as shown on the approved drawings.

## **PART 3.- EXECUTION**

### **INSTALLATION**

**Studs.**--Studs shall be erected plumb, except as needed for diagonal bracing or similar requirements. Channel tracks shall be aligned accurately to the wall layout at both floor and ceiling. Tracks shall be secured to floor and ceiling with fasteners spaced at not more than 406 mm intervals. Fasteners shall be provided at corners and ends of track.

Studs shall extend from floor to underside of ceiling except at wall openings. Each stud shall be secured to tracks at both top and bottom by bolting or screw fastening at both inside and outside flanges. Field welding shall not be permitted. A 12 mm clearance shall be provided at the top shoes. Door openings shall have double studs continuous across head and from floor to ceiling on each jamb.

Studs at openings shall be fastened solidly and securely to floor clips. Floor clips shall be fastened to the floor with 2 anchors unless otherwise shown on the plans.

Supplemental framing, blocking and bracing shall be installed in steel stud system wherever walls or partitions are to support fixtures, equipment, services, casework, heavy trim and furnishings, and similar work requiring attachment to the wall or partition.

One continuous, horizontal 19 mm channel reinforcement shall be placed approximately 152 mm above all wall openings. The reinforcement shall pass through the web openings in the studs and shall extend through the first stud located beyond the double studs at either side of the opening and shall be saddle tied to each stud it passes through.

**Joists and rafters.**--Joists and rafters shall be installed directly over bearing studs or a load distribution member shall be installed at the top track.

Web stiffeners shall be provided at reaction points where shown on the plans.

Ends of joists shall be reinforced with end clips, steel hangers, steel angle clips, steel stud section, or as otherwise recommended by the manufacturer.

Joists shall be secured to interior support systems to prevent lateral movement of bottom flanges.

## **12-5.05 BUILDING MISCELLANEOUS METAL**

### **PART 1 - GENERAL**

Scope: This work shall consist of fabricating, furnishing, and installing building miscellaneous metal in accordance with the details shown on the plans and these special provisions.

Building miscellaneous metal shall consist of the following:

1. Handrailing, including posts and post pockets
2. Permanent guard booth fascia including pipe and grid

Including all anchors, fastenings, hardware, accessories, and other supplementary parts necessary to complete the work.

## REFERENCES

Codes and Standards: Welding of steel shall be in accordance with American Welding Society (AWS) D 1.1, "Structural Welding Code - Steel" and D 1.3, "Structural Welding Code - Sheet Steel."

## SUBMITTALS

**Product Data:** Submit manufacturer's specifications, anchor details, and installation instructions for products used in miscellaneous metal fabrications.

**Working Drawings:** Working drawings of fabricated items shall be submitted for approval.

## QUALITY ASSURANCE

**Shop Assembly:** Preassemble items in shop to the greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark all units for reassembly and installation.

**Inspection and Tests:** Materials and fabrication procedures shall be subject to inspection and tests by the Engineer, in mill, shop, and field. Such tests will not relieve the Contractor of responsibility of providing materials and fabrication procedures in compliance with specified requirements.

## PART 2 - PRODUCTS

### MATERIALS

**Steel Bars, Plates, and Hot-rolled Shapes:** Steel bars, plates, and hot-rolled shapes shall conform to ASTM A 36/A 36M.

**Pipe:** Pipe shall be commercial quality standard steel pipe.

**Hollow Structural Sections:** Hollow structural sections shall conform to ASTM A 500/A 500M, Grade B, or A 501.

### Bolts, Studs, Threaded Rods, Nuts, and Washers:

Bolts, studs, and threaded rods for general application shall conform to ASTM A 307 or F 1554, Grade 36.

Nuts shall conform to ASTM A 563M, Grade A.

Washers bearing on wood surfaces shall be commercial quality. Washers bearing on steel surfaces shall conform to ASTM F 844 or F 436M.

**Fittings:** Brackets, bolt, threaded studs, nuts, washers, and other fittings for railings and handrailings shall be commercial quality pipe and fittings.

**Expansion Anchors:** Expansion anchors shall be ICC approved for the purpose intended, integral stud type anchor or internally threaded type with independent stud, hex nut, and washer.

## **FABRICATION**

### **Workmanship and Finish:**

Workmanship and finish shall be equal to the best general practice in modern shops.

Miscellaneous metal shall be clean and free from loose mill scale, flake rust and rust pitting, and shall be well formed and finished to shape and size with sharp lines and angles. Bends from shearing or punching shall be straightened.

The thickness of metal and details of assembly and support shall give ample strength and stiffness.

Built-up parts shall be true to line and without sharp bends, twists, and kinks. Exposed ends and edges of metal shall be milled or ground smooth, with corners slightly rounded.

Joints exposed to the weather shall be made up to exclude water.

**Galvanizing:** Items indicated on the plans to be galvanized shall be hot-dip galvanized after fabrication. The weight of galvanized coating shall be at least 460 grams per square meter of surface area, except drainage grates shall have at least 610 grams per square meter of surface area.

**Painting:** Building miscellaneous metal items that are not galvanized shall be cleaned and coated with one prime coat prior to erection in accordance with the requirements specified under "Painting" in Section 12-9 of these special provisions. After erection, surfaces shall be coated with a second prime coat, and finish coats when specified, in accordance with the requirements specified under "Painting" in Section 12-9.

### **Drainage Pipes:**

Drain piping shall have connections sealed watertight.

### **Steel Pipe Railings and Handrailings:**

Pipe handrailing shall consist of handrailing elements supported by metal brackets (wall type) or handrailing elements supported by tubular steel posts (post type).

Ends of railing pipe shall be closed, except for a 3 mm diameter weep hole at the low point.

All corners on railings shall be rounded. Simple and compound curves shall be formed by bending pipe in jigs to produce uniform curvature; maintain cylindrical cross-section of pipe throughout the bend without buckling, twisting or otherwise deforming exposed surfaces of the pipe.

Wall brackets, end closures, flanges, miscellaneous fitting and anchors shall be provided for interconnections of pipe and attachment of railings and handrails to other work. Inserts and other anchorage devices shall be furnished for connecting railings and handrails to concrete or masonry.

Steel railing shall be galvanized after fabrication. After galvanizing, all elements of the railing shall be free of fins, abrasions, rough or sharp edges, and other surface defects and shall not be kinked, twisted, or bent.

## **PART 3 - EXECUTION**

### **GENERAL**

#### **Anchorage:**

Anchorage devices and fasteners shall be provided for securing miscellaneous metal in-place construction; including threaded fasteners for concrete and masonry inserts, toggle bolts, through bolts, lag bolts, wood screws, and other connectors.



Cutting, drilling, and fitting shall be performed as required for installation of miscellaneous metal fabrications. Work is to set accurately in location, alignment and elevation, plumb, level, true and free of rack, measured from established lines and levels.

#### **Steel Pipe Railings and Handrailings:**

Railings shall be adjusted prior to anchoring to ensure matching alignment at abutting joints. Secure posts and railing ends to building construction as shown on the plans.

Resin capsule anchors shall not to be used for anchoring railings and handrailings.

#### **DAMAGED SURFACES**

Galvanized surfaces that are abraded or damaged shall be repaired by thoroughly wire brushing the damaged areas and removing all loose and cracked coating. The clean areas shall then be painted with 2 spot applications of a coating conforming to the requirements in the Detailed Performance Standards of the Master Painters Institute (MPI) and listed on MPI List Number 18, Primer, Zinc Rich, Organic.

### **12-5.06 STAIR NOSING**

#### **PART 1.- GENERAL**

##### **SUMMARY**

**Scope.**--This work shall consist of furnishing and installing stair nosings in accordance with the details shown on the plans and these special provisions.

##### **SUBMITTALS**

**Product data.**--Manufacturer's descriptive data and installation instructions shall be submitted for approval.

#### **PART 2.- PRODUCTS**

##### **MANUFACTURERS**

**Acceptable manufacturers.**--Subject to these special provisions, acceptable manufacturer's shall be American Safety Tread Co., Inc., Model No. FA-211D, Safety yellow color; Armstrong Products Inc., Model No. S62, Red color; Wooster Products Inc., Model No. WPC, Safety yellow color; or equal.

##### **MATERIALS**

##### **Stair nosing**

Stair nosing shall be factory fabricated units made of heavy duty, heat treated 6063-T5 extruded aluminum base with anchors and an abrasive filler.

Stair nosing shall meet OSHA requirements for anti-slip safety on stairs.

The anti-slip filler shall be firmly adhered to the base, and shall be composed of aluminum oxide and an epoxy binder. The color shall extend uniformly throughout out the filler. The filler shall contain not less than 60 percent aluminum oxide.

The base anchor system shall stabilize the nosing, prevent rocking and loosening, and shall permanently lock the nosing into place.

## **PART 3.- EXECUTION**

### **INSTALLATION**

**General.**--The stair nosing shall be securely installed to prevent rocking or other movement during placing of concrete.

## **SECTION 12-6. WOOD AND PLASTICS**

### **12-6.01 CABINETS**

#### **PART 1.- GENERAL**

##### **SUMMARY**

**Scope.**--This work shall consist of furnishing and installing plastic laminate tops, splashes and returns as shown on the plans and as described in these special provisions.

##### **SUBMITTALS**

**Product data.**--Manufacturer's product data for plastic laminates shall be submitted for approval.

**Samples.**--Three samples shall be submitted for each of the items shown below:

Plastic laminate, 203 mm x 254 mm for each type, color, pattern and surface finish.

**Working drawings.**--Working drawings for plastic laminated top showing location of plastic laminated top, dimensioned plans and elevations, attachment devices and other components shall be submitted for approval. Working drawings shall bear the "WIC Certified Compliance Label" on the first sheet of the drawings.

##### **QUALITY ASSURANCE**

**Codes and standards.**- Plastic laminated tops shall be manufactured and installed in accordance with the Manual of Millwork of the Woodwork Institute of California (WIC) requirements for the grade or grades specified or shown on the plans.

**Certificates of Compliance.**--Each plastic laminate top shall bear the WIC Certified Compliance Label.

##### **DELIVERY, STORAGE AND HANDLING**

**Protection.**-- Plastic laminated top shall be protected during transit, delivery, storage and handling to prevent damage, soiling and deterioration.

#### **PART 2.- PRODUCTS**

##### **ACCEPTABLE MANUFACTURERS**

**Manufacturers.**--Subject to compliance with these specifications, high pressure decorative laminates shall be Consoweld Corp.; Formica Corp.; Nevamar Corp.; or equal.

##### **MANUFACTURED UNITS**

###### **Laminated counter tops and splashes**

Laminated counter tops and splashes shall be WIC custom grade.

Surface material shall be high pressure laminated plastic conforming to NEMA LD-3, 1.27 mm thickness.

Unless otherwise shown on the plans, splashes shall be 102 mm high from the surface of the deck. Back splashes shall be continuous formed and coved. Side splashes shall be top set.

Laminated counter tops self edged, counter tops to receive sinks or plumbing fixtures shall have a bullnose.

The underside of tops and backsides of splashes shall be covered with an approved backing sheet.

## **FABRICATION**

**Shop assembly.**--Nails shall be countersunk and the holes filled, molds shall be neatly mitered and all joints shall be tight and true.

As far as practicable, work shall be assembled at the mill and delivered to the building ready to be set in place. Parts shall be smoothly dressed and interior work shall be belt sanded at the mill and hand sanded at the building. After assembly, work shall be cleaned and made ready for the specified finish.

**Precut openings.**--Openings for hardware, appliances, plumbing fixtures, and similar items shall be precut where possible. Openings shall be accurately located and templates used for proper size and shape. Edges of cutouts shall be smoothed and edges sealed with a water-resistant coating.

## **PART 3.- EXECUTION**

### **INSTALLATION**

**Laminate tops.**--Laminate tops shall be securely fastened to base units and other support systems as indicated on the approved drawings.

## **SECTION 12-7. THERMAL AND MOISTURE PROTECTION**

### **12-7.01 INSULATION (GENERAL)**

#### **PART 1.- GENERAL**

##### **SUMMARY**

**Scope.**--This work shall consist of furnishing and installing insulation in accordance with the details shown on the plans and these special provisions.

Insulation materials shall be as specified in these special provisions, and shall be compatible with existing or new materials incorporated in the building.

##### **SUBMITTALS**

**Product data.**--A list of materials, manufacturer's descriptive data, location schedule, and time schedule shall be submitted for approval.

The list of materials to be used shall include the trade name, manufacturer's name, smoke developed and flame spread classification, resistance rating and thickness for the insulation materials and accessories.

**Schedules.**--A location schedule and time schedule shall be submitted for approval.

The location schedule shall show where each material is to be installed.

The Contractor shall provide the Engineer at the jobsite with an accurate time schedule of the areas of the building to be insulated each day. The time schedule shall be submitted 3 working days in advance of the work.

**Samples.**--Samples of insulation material shall be submitted to the Engineer at the jobsite.

## QUALITY ASSURANCE

**Codes and standards.**--All insulating materials shall be certified to comply with the California Quality Standards for Insulating Materials and shall be listed in the Department of Consumer Affairs publication "Consumer Guide and Directory of Certified Insulation Material."

## DELIVERY, STORAGE AND HANDLING

**General.**--Insulating materials shall be delivered to the jobsite and stored in a safe dry location with labels intact and legible.

Insulating materials shall be protected from physical damage and from becoming wet or soiled.

In the event of damage, materials shall be repaired or replaced as necessary to comply with these specifications.

### PART 2.- PRODUCTS (Not applicable.)

### PART 3.- EXECUTION (Not applicable.)

## 12-7.02 RIGID ROOF INSULATION

### PART 1 - GENERAL

#### SUMMARY

**Scope:** This work shall consist of furnishing and installing rigid roof insulation in accordance with the details shown on the plans and these special provisions.

Rigid insulation shall include rigid insulation, underlayment, wood nailers, fasteners and such other materials, not mentioned, which are required for the complete installation of the rigid insulation system. Materials and installation shall be coordinated with the roof covering system to meet the requirements for a Class 1 Factory Mutual approved assembly.

### PART 2 - PRODUCTS

**Underlayment:** Underlayment shall be building paper, Type I (No. 15) asphalt roofing felt, or rosin-sized paper.

**Rigid Roof Insulation:** Rigid roof insulation shall be multilayer, preformed board roof insulation having thermal conductance or resistance as shown on the plans. Rigid roof insulation shall be expanded perlite board conforming to ASTM Designation: C 728 and shall be compatible with the torch applied roofing system.

**Insulation Tape:** Insulation tape shall be as recommended by the insulation manufacturer.

**Bitumen:** Bitumen shall conform to ASTM Designation: D 312, for Type III roofing asphalt.

**Wood Nailers:** Wood nailers shall be Douglas fir, hem-fir or equivalent western softwood pressure treated after fabrication. Wood preservatives shall be waterborne type.

**Fastener (Metal Decking):** Fastener (metal decking) shall be galvanized spring steel barbed clip driven through galvanized 25 mm minimum nominal diameter caps; galvanized hardened steel nail with 25 mm minimum nominal diameter head and serrated shank to provide backout resistance; or threaded self tapping screw driven through 76 mm minimum nominal diameter galvanized cap.

## **PART 3 - EXECUTION**

### **Preparation:**

The preparation of the deck surfaces shall conform to the manufacturer's recommendations and these special provisions.

The deck surface shall be made smooth and level.

### **Installation:**

Underlayment shall be fastened to nailable decks with randomly located roofing nails.

Insulation panels shall be placed in at least 2 layers with end joints staggered and with joints of the second layer offset at least 152 mm from joints in the first layer.

Insulation panels shall be oriented with the long side perpendicular to the direction roofing felts are to be laid. End joints between panels shall be staggered.

Insulation clips and fasteners shall resist the wind uplift classification specified for the roof covering.

Wood nailers shall be thick enough so the tops are flush with surrounding insulation. Perimeter nailers shall extend at least 51 mm beyond flanges of metal flashings or gravel stops. On roofs that are steeper than 2 inches per foot, perimeter wood nailers shall be supplemented by nominal 102 mm wide wood nailers installed parallel to eaves (horizontal) at a maximum spacing of 2440 mm. Wood nailers shall be securely fastened using at least two 16d nails to each framing member.

The first layer of insulation shall be mechanically fastened as recommended by the manufacturer to meet the requirements of the Factory Mutual Loss Prevention Data 1-28. At least one fastener per 0.2 square meter of insulation panel shall be used. Panels that are cracked or broken by the installation of the mechanical fasteners shall be replaced.

Additional layers of insulation shall be secured with a solid uniform application of hot bitumen applied at the rate of 13.6 kilograms per 9.3 square meters.

The completed layer of insulation shall be smooth and level, and suitable for the proper bedding of succeeding layers of roofing material.

Insulation shall be laid just before application of roofing felts. Units shall be laid in parallel courses with transverse joints staggered, in moderate contact with adjoining surfaces.

No more insulation shall be laid than can be covered with roofing the same day. Cutoffs of 2 layers of hot mopped Type I (No. 15) asphalt saturated felt shall be installed, not less than 152 mm onto completed work and extended out not less than 152 mm onto the deck, at exposed edges of insulation at the end of each day's work. Cutoffs shall be removed when work is resumed.

Joints in the top layer of roof insulation shall be taped with 152 mm wide felt stripping set in hot asphalt mopping.

Continuous joints between insulation units and parallel to decking flutes shall not occur over the flute openings. Both units shall have full edge bearing on rib tops.

Insulation panels with broken or crushed corners or edges shall be trimmed free of such defects or shall be discarded. Replacement boards less than 305 mm wide shall not be used.

Damaged insulation in the completed work shall be removed and replaced. Insulation that has been wet or is wet shall be considered damaged.

## 12-7.03 COMPOSITE PANELS

### PART 1.- GENERAL

#### SUMMARY

This work shall consist of designing, fabricating, furnishing and installing a water tight Rout and Return Dry panel aluminum composite panel system as shown on the plans and these special provisions. The Rout and Return Dry panel system must consist of a dry gasket interlocking system. The panel system shall consist of dry gasketed perimeter extrusions, extruded stiffeners, gaskets, fasteners, shims, related flashings and adaptors, furring, and other miscellaneous accessories required for a complete watertight installation. Work also includes parapet coping, column covers, soffits, border, extruded aluminum metal shaped accessories, and filler items indicated as integral components of the panel system or as designed. Assembly shall be water and airtight without reliance on a secondary backup membrane.

#### QUALITY ASSURANCE

**Fabrication History.**--Fabricator shall assume undivided responsibility for all components of the panel work and shall demonstrate no less than five years experience of metal panel work similar in scope and size to this project.

**Performance Requirements.**--Work shall conform with all applicable codes and regulations.

**Design Criteria.**--Make allowances for free and noiseless vertical and horizontal thermal movement due to the contraction and expansion of component parts, for ambient temperature range of -6.67 °C to 82 °C. Buckling, opening of joints, undue stress on fasteners, failure of sealants or any other detrimental effects due to thermal movement of component parts will not be permitted. Fabrication, assembly and erection procedure shall take into account the ambient temperature range at the time of the operation.

**Wind Loads.**--Assemblies shall be designed for flexural, shear and torsional stresses for the following positive and negative wind pressures acting normal to the place of the assemblies. Loading design shall be as specified on the drawings.

#### Pressure and Load.

Normal to the plane of the wall between structural supports, deflection of the connected perimeter framing members shall not exceed 1/175 of span length or 19 mm, whichever is less.

At connection points of framing members to anchors, anchor deflection in any direction shall not exceed 1.6 mm. Where connection points are not clearly defined, maximum anchor deflection shall not exceed 1.6 mm.

Stresses must take into account interaction and in no case shall allowable values exceed the yield stress.

At 1.5 times design pressure, permanent deflections of framing members must not exceed 1/1000 of the span length, and components must not experience failure or gross permanent distortion. At connection points of framing members to anchors, permanent set shall not exceed 1.6 mm.

**Flatness Criteria.**--Maximum 13 mm in 15 on panel in any direction for assembled units. (Not accumulative)

**General Approval.**--Composite panel manufacturer shall have an ICBO research report.

**Field measurements.**--Shall be taken prior to the completion of shop fabrication whenever possible. However, coordinate fabrication schedule with construction progress to avoid delay of work. Field fabrication may be allowed to ensure proper fit. However, field fabrication shall be kept to an absolute minimum with the majority of the fabrication being done under controlled shop conditions.

**Source Limitations.**--Obtain each type of metal-faced composite wall panel from single source from single manufacturer

## TESTS

**Wall system.**--Walls furnished shall have been tested. If such tests are not available, mockups shall be constructed and tests performed. Test results shall meet or exceed the following:

**Air infiltration.**--When tested in accordance with ASTM E283, air infiltration at 30.49 kgsm must not exceed 0.002cmm per 0.09 square meter of wall area.

**Static Water Infiltration.**--Water infiltration is defined as the appearance of uncontrolled water on the wall. Design shall provide drainage to the exterior face of the wall, any leakage of water occurring at joints and/or any condensation taking place within the construction. No water infiltration under static pressure with ASTM E331 at a differential static pressure of 73 kgsm, after 15 minutes.

**Structural Performance.**--Shall be tested in accordance with ASTM E330 at design pressure. After initial test, test at 150 % of design pressure. No permanent deformation exceeding 1/1000 or failure to structural members allowed.

**Seismic Racking.**--There shall be no failure or deterioration of the system when the unit is laterally racked to 19 mm in both directions and repeated for three cycles.

**Bond Integrity Test.**--When in accordance with ASTM D1781 for bond integrity, simulating resistance to delamination.

## Peel Strength:

Fire Performance: ASTM E84 maximum value flame spread 0, smoke developed 0.

UBC 17-5 No flame spread along interior face or penetration through the wall assembly.

ASTM 162: No surface flaming.

## SUBMITTALS

**Product Data.**--For each type of product indicated. Include catalog cuts, construction details, installation instructions, material descriptions, dimensions of individual components and profiles, and finishes for each type of metal-faced composite wall panel and accessory.

**Samples.**--(5) metal panel samples (203 mm x 203 mm in size), five panel anchorage system samples. Also provide sample of extruded accessory shaped metal.

## Working Drawings

Working drawings and engineering calculations shall be submitted for approval.

Working drawings shall show the shape, size, thickness, and method of attachment for each component used in the work; the layout and spacing of fasteners; details of connections and closures; and details for expansion joints and weathertight joints.

Design calculations for the fastening system with the substrate shown on the plans shall be submitted to verify compliance with the design requirements.

Working drawings and design calculations shall be stamped and signed by an engineer who is registered as a Civil or Structural Engineer in the State of California. The expiration date of the registration shall be shown. The Engineer's signature shall be original.

The engineering calculations for the design of the metal panel system shall include applied loads, load combinations, panel stresses and deflections, fastener loads and stresses and provisions for accommodating the canopy deflections.

### **Mock up**

Construct full size mock-up per that outlined on the drawings. Mock-up must be approved prior to ordering materials and release of panels for fabrication.

Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Engineer specifically approves such deviations in writing.

**Acceptable fabricator's.**--The following are acceptable manufacturer's providing they meet all of the criteria for this specification; Elward Systems Corporation, CSP Wall Systems, Center Glass Company, Universe Corporation, or equal.

### **PREINSTALLATION CONFERENCE**

1. Meet with Engineer, metal-faced composite wall panel Installer, metal-faced composite wall panel manufacturer's representative, structural-support Installer, and installers whose work interfaces with or affects metal-faced composite wall panels.
2. Review methods and procedures related to metal-faced composite wall panel installation, including manufacturer's written instructions.
3. Examine support conditions for compliance with requirements, including alignment between and attachment to structural members.
4. Review flashings, special siding details, wall penetrations, openings, and condition of other construction that will affect metal-faced composite wall panels.
5. Review temporary protection requirements for metal-faced composite wall panel assembly during and after installation.
6. Review wall panel observation and repair procedures after metal-faced composite wall panel installation

### **DELIVERY, HANDLING AND STORAGE**

Deliver components, sheets, metal-faced composite wall panels, and other manufactured items so as not to be damaged or deformed. Package metal-faced composite wall panels for protection during transportation and handling.

Unload, store, and erect metal-faced composite wall panels in a manner to prevent bending, warping, twisting, and surface damage.

Store metal-faced composite wall panels vertically, covered with suitable weathertight and ventilated covering. Store metal-faced composite wall panels to ensure dryness, with positive slope for drainage of water. Do not store metal-faced composite wall panels in contact with other materials that might cause staining, denting, or other surface damage. Do not allow storage space to exceed 50 C.

Retain strippable protective covering on metal-faced composite wall panel for period of panel installation.

### **PROJECT CONDITIONS**

**Weather Limitations.**--Proceed with installation only when existing and forecasted weather conditions permit assembly of metal-faced composite wall panels to be performed according to manufacturer's written instructions and warranty requirements.

### **COORDINATION**

Coordinate metal-faced composite wall panel assemblies with rain drainage work, flashing, trim, and construction of studs, soffits, and other adjoining work to provide a leak proof, secure, and non corrosive installation.



## **PART 2.- PRODUCTS**

### **MATERIALS**

#### **SHEET MATERIAL**

##### **Panel coating**

Three-Coat Fluoropolymer: AAMA 620. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in both color coat and clear topcoat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions. The coating system shall not be field applied. The color of the panel coating shall be as shown on the plans.

##### **Aluminum composite material**

Panels shall match the color shown on the plans and the following:

1. Composite metal panel shall consist of two exterior sheets of 0.51 mm thick AA3000 series aluminum alloy and a core of extruded thermoplastic. The exterior sheets and core shall be bonded together with no glues or adhesives. The panels shall be integrated into a 41 mm maximum depth extruded aluminum edge grip system. The edge grip system shall be of 6063-T5 aluminum alloy.
2. The maximum allowable fabrication tolerances for the panels shall be as follows:

Panel Bow	Maximum of 0.8 percent of length or width panel dimension
Width or thickness	4 mm
Length	3 mm
Camber	0.8 mm
End Squareness	0.25 percent of panel width

3. All panels surfaces shall be free of seams, warp, and buckling. The panel lines, breaks and angles shall be sharp and true.
4. The metal panel system shall have an internal drainage system to catch condensation and any other accumulations of moisture and direct it to discharge weeps.
5. Attachment clips, fasteners, furring, shims, brackets and miscellaneous hardware shall be stainless steel and shall be as recommended by the metal panel manufacturer. All fasteners shall be concealed.
6. Acceptable products are Alucobond, Reynobond, Alpollic, or equal.

##### **Sealants and gaskets**

Joint Sealant: ASTM C 920; elastomeric polyurethane, polysulfide, or silicone sealant; of type, grade, class, and use classifications required to seal joints in metal-faced composite wall panels and remain weathertight; and as recommended in writing by panel manufacturer. Sealant and gaskets shall be black in color.

##### **Edge trim**

Edge trim shall be extruded aluminum with integral weather-stripping as detailed on the plans so as to provide the following features:

1. Rout and return of the composite aluminum sheet on all perimeters. "Continuous Edge Grip" is not acceptable.
2. Exposed edge of composite aluminum sheet shall be protected inside an extruded aluminum pocket.
3. Maximum overall panel thickness shall not exceed 3 inches nor be less than 51 mm.
4. The composite aluminum sheet shall be mechanically attached to all perimeter extrusions.
5. Color shall be black painted silicone modified polyester.

### **Stiffeners**

Extruded aluminum sections secured to edge trim and bonded to rear face of composite aluminum sheet with silicone, and of sufficient size and strength to maintain flatness of the panel within the specified tolerances. Stiffeners shall have a mill finish.

### **Flashings**

Fabricate flashing from 1.6 mm thickness aluminum sheet; where exposed to biew finish to match adjacent panels. Provide lap strip under flashing at abutted conditions, with lapped surfaces sealed with full bed of non-hardening sealant.

### **Accessories**

**Wall Panel Accessories.**--Provide components required for a complete metal-faced composite wall panel assembly including trim, copings, fasciae, mullions, sills, corner units, clips, flashings, sealants, gaskets, fillers, closure strips, and similar items. Match material and finish of metal-faced composite wall panels unless otherwise indicated.

**Flashing and Trim.**--Formed from 0.46 mm minimum thickness, zinc-coated (galvanized) steel sheet or aluminum-zinc alloy-coated steel sheet prepainted with coil coating. Provide flashing and trim as required to seal against weather and to provide finished appearance. Locations include, but are not limited to, bases, drips, sills, jambs, corners, endwalls, framed openings, parapet caps, soffits, reveals, and fillers. Finish flashing and trim with same finish system as adjacent metal-faced composite wall panels.

**Extruded Aluminum Shape.**--An aluminum shape which may be selected from standard configurations, modified configurations, or customized that is anchored directly to the curtain wall mullions and integrated with composite wall panel system. Color and finish to match that of composite panels.

### **Miscellaneous Metal Framing**

Miscellaneous Metal Framing, General:

ASTM C 645, cold-formed metallic-coated steel sheet, ASTM A 653/A 653M, G40 (Z120) hot-dip galvanized or coating with equivalent corrosion resistance unless otherwise indicated.

Hat-Shaped, Rigid Furring Channels:

Nominal Thickness: As required to meet performance requirements  
Depth: As indicated.

Cold-Rolled Furring Channels:

Minimum 13 mm wide flange.  
Nominal Thickness: As required to meet performance requirements  
Depth: 19 mm.  
Furring Brackets: Adjustable, corrugated-edge type of steel sheet with nominal thickness of 1 mm.

## **PART 3. -EXECUTION**

### **EXAMINATION**

Examine wall framing to verify that girts, angles, channels, studs, and other structural panel support members and anchorage have been installed within alignment tolerances required by metal-faced composite wall panel manufacturer.

Examine wall sheathing to verify that sheathing joints are supported by framing or blocking and that installation is within flatness tolerances required by metal-faced composite wall panel manufacturer.

Proceed with installation only after unsatisfactory conditions have been corrected

## **PREPARATION**

The metal panel system shall be installed rigidly and securely in accordance with the manufacturer's recommendations.

Extreme care shall be exercised in handling, storing, moving and installation the metal panels to avoid twisting, racking, scratching, denting, chipping, staining or any other type of damage or distortion. Panels damaged in handling or installing shall be replaced by the Contractor at his expense.

Fabricate panels so that the panel thickness at the joinery is 45 mm.

Miscellaneous Framing: Install subgirts, base angles, sills, furring, and other miscellaneous wall panel support members and anchorage according to ASTM C 754 and metal-faced composite wall panel manufacturer's written instructions

## **INSTALLATION**

Panels shall be erected in accordance with an approved set of working drawings.

Anchor panels securely per engineering recommendations and in accordance with approved shop drawings to allow for necessary thermal movement and structural support.

Conform to panel fabricator's instructions for installation of concealed fasteners.

Do not install component parts that are observed to be defective, including warped, bowed, dented, abraded, and broken members.

Panels shall be accurately positioned to maintain the straight joint lines between panels as shown on the plans. Joints shall be kept uniform throughout the installation and shall be of sufficient width to accommodate the deflections of the frame and the expansion and contraction of the panels but shall not exceed 13 mm in width.

Adjoining panels shall be aligned and matched to one another at the joints. The surfaces at the edges of each panel shall be flush with the surfaces at the edges of the adjacent panels.

Neoprene isolation material shall be provided to separate adjoining incompatible metals. Nylon washers shall be used to separate canopy members, fasteners, clips, and brackets of ferrous metal (except stainless steel) from aluminum.

Openings through the panels for penetrations shall be cut square to present a neat and true appearance with exposed burrs, removed. Openings shall be reinforced and sealed as recommended by the panel manufacturer.

A dry gasket shall be the primary method to seal joints. The dry gasket shall be compatible with silicone sealants.

Other surfaces necessary to use sealants shall be clean and shall be free of dust, dirt oil, moisture and other deleterious matter that might adversely affect the adhesion of the sealant. Primer shall be applied in accordance with the sealant manufacturer's instructions. Application of backing materials and sealant shall be in accordance with the panel manufacturer's working drawings and the sealant manufacturer's instructions, all as specified under Submittals," in these special provisions.

Joints to be sealed shall be inspected for construction defects that would adversely affect the execution of the work. Unsatisfactory conditions shall be corrected before the joint sealant is applied.

The installation metal panel system shall be weathertight.

## **ADJUSTING AND CLEANING**

Remove and replace panels damaged beyond repair as a direct result of the panel installation. After installation, panel repair and replacement shall become the responsibility of the General Contractor.

Repair panels with minor damage.

Make sure weep holes and drainage channels are unobstructed and free of dirt and sealants.

The metal panel system shall be thoroughly cleaned after installation to remove excess sealant, tapes, dirt, grease or other unsightly materials. Cleaning shall be in accordance with the panel and sealant manufacturer's instructions.

## 12-7.04 SHEET METAL FLASHING

### PART 1.- GENERAL

#### SUMMARY

**Scope.**—This work consists of furnishing and installing sheet metal trim and flashing in accordance with the plans and these special provisions. Sheet metal flashing includes but is not limited to: Manufactured reglets, formed roof drainage system, formed roof flashing and trim, formed wall flashing, and trim.

#### PERFORMANCE REQUIREMENTS

**General:** Install sheet metal flashing and trim to withstand wind loads, structural movement, thermally induced movement, and exposure to weather without failing, rattling, leaking, and fastener disengagement.

#### SUBMITTALS

**Product data.**—Manufacturer's product data, application, installation and maintenance instructions. For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.

**Working Drawings.**—Working drawings, indicating complete dimensions, installation and construction details:

1. Show layouts of sheet metal flashing and trim, including plans and elevations. Distinguish between shop- and field-assembled work. Include the following:
2. Identify material, thickness, weight, and finish for each item and location in Project.
3. Details for forming sheet metal flashing and trim, including profiles, shapes, seams, and dimensions.
4. Details for fastening, joining, supporting, and anchoring sheet metal flashing and trim, including fasteners, clips, cleats, and attachments to adjoining work.
5. Details of expansion-joint covers, including showing direction of expansion and contraction.

**Samples.**—Samples for Verification: For each type of exposed finish required, prepared on Samples of size indicated below:

1. Sheet metal Flashing: 300 mm long. Include fasteners, clips, closures and other attachments.
2. Trim: 300 mm long. Include fasteners, and other accessories.
3. Accessories: Full size samples of each type.

#### QUALITY ASSURANCE

**Codes and standards.**--Sheet metal work shall in accordance with the requirements in the latest edition of the Sheet Metal and Air Conditioning Contractors National Association (SMACNA) "Standard Practice in Architectural Sheet Metal Work."

#### DELIVERY STORAGE AND HANDLING

**Storage and Protection.**—Deliver flashing, trim materials and fabrications undamaged. Protect flashing and trim materials and fabrications during transportation and handling.

Unload, store, and install flashing, trim materials and fabrications in a manner to prevent bending, warping, twisting, and surface damage.

Stack materials on platforms or pallets, covered with suitable weathertight and ventilated covering. Do not store flashing and trim materials in contact with other materials that might cause staining, denting, or other surface damage.

## **PART 2.- PRODUCTS**

### **MATERIALS**

#### **Galvanized sheet steel**

Galvanized sheet steel shall conform to ASTM Designation: A 653/A 653M with G 90 [Z275] coating, not less than 0.71 mm (24-gage), unless otherwise shown on the plans. Surfaces to be painted shall not have factory coatings on galvanizing that cannot be removed by paint thinner.

#### **Flashing and Trim Materials**

Flashing and trim materials shall match the materials used for metal ceiling and roofing. Zinc titanium copper alloy sheet: Electrolytic, 99 percent pure zinc alloyed with 1 percent titanium and copper, with pre-weathered finish.

### **COMPONENTS**

Reglets: Units of type, material, and profile indicated, formed to provide secure interlocking of separate reglet and counter flashing pieces, and compatible with flashing indicated with factory mitered and welded corners and junctions.

### **ACCESSORIES**

Provide materials and types of fasteners, solder, welding rods, protective coatings, separators, sealants, and other miscellaneous items as required for complete sheet metal flashing and trim installation.

#### **Fasteners**

Wood screws, annular threaded nails, self-tapping screws, self-locking rivets and bolts, and other suitable fasteners designed to withstand design loads. Hardware and fastening for roof flashings shall be A316 stainless steel.

#### **Insect screen**

Insect screen shall be industrial wire cloth and screen, medium grade, 18 mesh, 0.43 mm diameter, 1 mm openings, plain weave, galvanized steel conforming to ASTM Designation: E 437.

#### **Sealant**

Sealant for exposed locations shall be a silicone sealant conforming to ASTM Designation: C 920.

#### **Primer**

Primer shall be as recommended by the sealant manufacturer.

### **FABRICATION**

**General.**--Sheet metal shall be assembled to Sheet Metal and Air Conditioning Contractors National Association Standards.

Sheet metal shall be formed to the sizes, shapes and dimensions shown on the plans or as specified herein with angles and lines straight, sharp and in true alignment. The number of joints shall be kept to a minimum.

Angle bends and folds for interlocking the metal shall be made with full regard for expansion and contraction to avoid buckling or fullness in the metal after it is installed.

Joints in sheet metal work shall be closed watertight unless slip joints are specifically required. Watertight joints shall be mechanically interlocked and then thoroughly soldered for metals other than aluminum. Watertight joints in aluminum or between aluminum and other metals shall be sealed with acrylic sealant.

Sheet metal joints to be soldered shall be cleaned with steel wool or other means, pre-tinned and soldered watertight.

All joints shall be wiped clean of flux after soldering. Acid flux shall be neutralized by washing the joints with sodium bicarbonate.

Flashings shall have a 45 degree drip return at bottom edges. Unless otherwise shown on the plans, counterflashing shall extend not less than 100 mm over roofing or other materials protected by the counterflashing

and shall be arranged so that roofing or materials can be repaired without damage to the counterflashing. Where reglets are indicated, counterflashing shall be fastened by lead wedges or snap-in flashing.

### **PART 3.- EXECUTION**

#### **EXAMINATION**

Examine substrates, areas, and conditions, with Installer present, to verify actual locations, dimensions and other conditions affecting performance of work.

Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and securely anchored. Proceed with installation only after unsatisfactory conditions have been corrected,

**PREPARATION.--**Surfaces to receive sheet metal shall be clean, smooth and free from defects.

**PROTECTION.--**Where dissimilar metals will contact each other or corrosive substrates, protect against galvanic action by painting contact surfaces with bituminous coating or by other permanent separation as recommended by fabricator or manufacturers of dissimilar metals.

#### **INSTALLATION**

**Roof penetration flashings.--**All pipes, ducts, vents and flues passing through roofs shall be made waterproof with flashings of storm collars or counterflashings.

Roof penetration flashings shall be fabricated from galvanized sheet steel, not less than 0.71 mm (24-gage). Size and shape shall be as shown on the plans.

The lower flashing shall be galvanized sheet metal, 0.71 mm (24-gage), and extend 150 mm minimum from outside of the pipe in all directions and 38 mm above the top of the roofing.

The top flashing shall be galvanized sheet steel or sheet lead as shown on the plans.

**Downspouts.--**Downspouts shall be fabricated from galvanized sheet steel, not less than 0.71 mm (24-gage). Size and shape shall be as shown on the plans.

Downspouts shall be installed as shown on the plans, secured to the wall with straps near top, bottom and at intermediate points not more than 2.4 meters apart. Straps shall extend 50 mm out on wall and be secured with suitable anchors.

Unless otherwise shown on the plans, the lower end of downspout shall terminate with mitered 45 degree elbow.

**Premolded roof flashings.--**Premolded roof flashings shall be installed in accordance with the manufacturer's instructions.

#### **Cleaning and Protection**

1. Clean exposed metal surfaces of substances that interfere with uniform oxidation and weathering.
2. Clean and neutralize flux materials. Clean off all excess solder and sealants.
3. Remove temporary protective coverings and strippable films as sheet metal flashing and trim are installed. On completion of installation, clean finished surfaces, including removing unused fasteners, metal filings, pop rivet stems, and pieces of flashing. Maintain in a clean condition during construction.
4. Replace sheet metal flashing and trim that have been damaged or that have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

### **12-7.05 TORCH APPLIED ROOFING**

#### **PART 1.- GENERAL**

##### **SUMMARY**

**Scope.--**This work shall consist of furnishing and installing a torch applied roof covering system in accordance with the details shown on the plans and these special provisions.

Torch applied roofing system shall have a granular surfacing, and shall include all materials for constructing the roofing system complete and in place.

## **SUBMITTALS**

**Product data.**--Manufacturer's descriptive data and installation instructions for torch applied roofing system shall be submitted for approval.

## **QUALITY ASSURANCE**

**Codes and standards.**--Roofing materials shall conform to the rules for control of volatile organic emissions adopted by the local air pollution control district having jurisdiction in the area.

**Field samples.**--Materials shall be delivered to the jobsite in labeled containers or wrappings sufficiently ahead of their intended use to allow sampling and testing by the Engineer.

**Certificates of Compliance.**--Certificates of compliance shall be furnished for the metal roofroofing system in accordance with the requirements specified in Section 6-1.07, "Certificates of Compliance," of the Standard Specifications.

## **DELIVERY AND HANDLING**

**Storage.**--Stored or stockpiled roof roofing shall be set on end and shall be protected from the elements. Roofing rolls compressed into oval cross section shall not be used.

## **PART 2.- PRODUCTS**

### **Torch applied roofing and flashing**

Torch applied roofing shall be Class A or B fire retardant plastic bituminous roofing membrane. Plasticized bituminous compound, consisting of distilled asphalt mixed with polypropylene and petrochemical woven around a nonwoven polyester core.

Flashing rolls shall be properly sized for the application intended.

Top surface shall be embedded with slate flakes or mineral granules as follows:

- 4 mm smooth: For torch applied roofing on curved surfaces.
- 4.5mm granular: For torch applied roofing on flat surfaces.

### **Primer**

Primer for torch applied roofing shall be a water-based asphalt primer application for metal surfaces.

## **PART 3.- EXECUTION**

### **PREPARATION**

**General.**--Surfaces to be covered shall be smooth, hard, dry and shall be free from high spots, depressions, frost or defects from frost, dust loosened material or other debris.

Openings, holes or crevices shall be filled or covered before any roofing materials are applied.

### **INSTALLATION**

**Application.**--Torch applied roofing shall be installed to provide a watertight, non-leaking roof covering in accordance with the manufacturer's recommendations.

Torch applied roofing work and work of other trades shall be coordinated and scheduled to minimize interference and to eliminate traffic on the completed roof.

Torch applied roofing and roofing materials shall not be applied in wet weather or when ambient temperature is below 50° F. All drainage fixtures shall be set at the proper level to permit the free flow of water.

Primer shall be applied in a thin, continuous, uniform coating without skips or dry spots.

**Flashing.**--Flashings shall be installed as the roofing progresses to protect new facilities from damage resulting from rain, wind and storms. Any damage resulting from rain, wind or storms shall be corrected at the Contractors expense.

Torch applied flashings shall be placed after roofing is placed unless otherwise shown on the plans.

Torch applied flashings shall be one layer of flashing applied to metal substrate free of voids, fish mouths and wrinkles. No splices will be permitted.

## **CLEANUP**

**General.**--Upon completion of the work, the Contractor shall clean all exposed surfaces that are subject to spillage, over run and marking by torch applied roofing. Clean up methods and materials shall be as recommended by the manufacturer.

Cleanup methods shall not damage, discolor or otherwise affect the exposed surfaces.

## **12-7.06 JOINT SEALANT**

### **PART 1.- GENERAL**

#### **SUMMARY**

**Scope.**--This work shall consist of preparing and placing a joint sealant in accordance with the details shown on the plans and these special provisions.

The sealed joint shall consist of tempered hardboard, expanded polystyrene and a pourable joint seal.

#### **SUBMITTALS**

**Product data.**--Manufacturer's descriptive data, specifications and installation instructions shall be submitted to the Engineer at the jobsite for approval.

### **PART 2.- PRODUCTS**

#### **Tempered hardboard**

Tempered hardboard shall be 3 mm minimum thickness, commercial quality suitable for the use intended. Other facing materials may be used provided they furnish equivalent protection.

#### **Expanded polystyrene**

Expanded polystyrene shall be commercially available polystyrene board.

#### **Polyethylene foam**

Polyethylene foam shall be commercial quality, with a continuous, impervious, glazed top surface, suitable for retaining the liquid sealant in the joint while hardening.

#### **Primer**

Primer shall be as recommended by the sealant manufacturer.

#### **Joint sealant**

Joint sealant shall be a commercial quality, 2 component polyurethane sealant, which shall be self-levelling and withstand up to 25 percent movement.



## **PART 3.- EXECUTION**

### **PREPARATION**

**Forming.**--Groove for joint seal shall be formed to a uniform width and depth and to the alignment shown on the plans or as ordered by the Engineer. The completed groove shall have a top width within 3 mm of the width shown on the plans and the bottom width shall not vary from the top width by more than 2 mm.

At least 24 hours prior to installing the joint seal, the Contractor shall repair all spalls, fractures, breaks, or voids in the concrete surfaces of the joint groove.

The lip of the joint shall be bevelled by grinding as shown on the plans.

**Cleaning.**--Prior to sealing joints, expanded polystyrene, hardboard, concrete spillage and all foreign material shall be removed from the deck to the bottom of the formed joint.

Prior to placing the joint seal, the joint shall be cleaned by a method which shall include abrasive blast cleaning and then be cleaned with a high pressure air jets to remove all residue and foreign material.

### **INSTALLATION**

**Materials.**--No material shall be used which has skinned over or which has settled in the container to the extent that it cannot be easily redispersed by hand stirring to form a smooth uniform product.

Each container of material shall be clearly labeled or each delivery of material in the tanks of 2-component equipment shall be accompanied with a ticket showing designation (Component A or B), the manufacturer's name, lot or batch number, date of manufacture, date of packaging, and date, if any, beyond which the sealant shall not be used.

**Primer.**--A primer shall be applied to the sides of the groove and all exposed vertical surfaces in the joint prior to placing the sealant. Primer shall be dry at the time of placing the sealant. Contaminated primer shall be removed and replaced.

**Joint sealant.**--The 2-component sealant shall be mixed and placed in the groove in accordance with manufacturer's instructions. Unmixed liquid components which have been exposed to the atmosphere for more than 24 hours, shall not be used.

## **12-7.07 SEALANTS AND CAULKING**

### **PART 1.- GENERAL**

#### **SUMMARY**

**Scope.**--This work shall consist of furnishing and applying sealants and caulking which are required for this project, but not specified elsewhere, in accordance with the details shown on the plans and these special provisions.

**Related work.**--Pourable polyurethane joint sealant shall conform to the requirements under "Joint Sealant" elsewhere in this Section 12-7.

#### **QUALITY ASSURANCE**

**Certificates of Compliance.**--Certificates of compliance shall be furnished for the sealants and caulking in accordance with the requirements specified in Section 6-1.07, "Certificates of Compliance," of the Standard Specifications.

#### **SUBMITTALS**

**Product data.**--Manufacturer's descriptive data and installation instructions for all sealants shall be submitted for approval.

**Samples.**--Color samples of all sealants shall be submitted for approval. Unless otherwise shown on the plans, colors will be selected by the Engineer from the manufacturer's standard colors.

## **PART 2.- PRODUCTS**

### **MATERIALS**

**General.**--All sealants, primers and accessories shall be non-staining to adjacent exposed surfaces. Products having similar applications and usage shall be of the same type and same manufacturer. Gun consistency compound shall be used unless otherwise required by the job conditions.

#### **Acrylic sealant**

Acrylic sealant shall be one compound, solvent release acrylic sealant.

#### **Butyl sealant**

Butyl sealant shall be one component, skinning type.

#### **Silicone sealant**

Silicone sealant shall be one component, low modulus building sealant. Sealant shall be tack-free in one hour, shall not sag or flow, shall be ozone resistant and capable of 100 percent extension without failure.

#### **Joint sealant**

Joint sealant shall be a two-part, non sag polysulfide base, synthetic rubber sealant formulated from liquid polysulfide polymer.

#### **Backer rod**

Backer rod shall be round, open or closed cell polyurethane. Backer rod shall be sized such that it must be compressed between 25 and 75 percent of its uncompressed diameter during installation in the joint.

#### **Neoprene**

Neoprene shall conform to the requirements of ASTM Designation: C 542.

## **PART 3.- EXECUTION**

### **APPLICATION**

**General.**--Unless otherwise shown on the plans, sealants shall be applied in accordance with the manufacturer's instructions.

Silicone sealants shall not be used in locations where painting is required.

Butyl sealants shall not be used in exterior applications, and acrylic sealants shall not be used in interior applications.

Sealants shall be applied in a continuous operation for the full length of the joint. Immediately following the application of the sealant, the sealant shall be tooled smooth using a tool similar to that used to produce concave masonry joints. Following tooling, the sealant shall remain undisturbed for not less than 48 hours.

## **SECTION 12-8. DOORS AND WINDOWS**

### **12-8.01 HINGED DOORS**

**GENERAL.**--This work shall consist of furnishing and installing hinged doors and frames in accordance with the details shown on the plans and these special provisions.

**SUBMITTALS.**--Manufacturer's descriptive data, installation instructions for fire rated assemblies and a door schedule shall be submitted for approval. The door schedule shall include a description of the type, location and size of each door and frame.

## **PRODUCTS**

### **Metal door**

Metal door shall be flush, seamless steel door factory prepared and reinforced to receive hardware and having cold rolled stretcher leveled sheet steel face sheets not less than 1.2 mm thick (18-gage). Face sheets shall be bonded with thermosetting adhesive to rigid board honeycomb or precured foam core; or face sheets shall be welded to all parts of an assembled grid of cold formed pressed metal stiffeners and framing members located around edges, ends, openings and at all locations necessary to prevent buckling of face sheets. Seams shall be tack welded, filled and ground smooth. Bottom edge and internal stiffeners of grid type core shall have moisture vents. Welds on exposed surfaces shall be ground smooth. Louvered or glazed openings shall be provided where shown on the plans.

Where fire rated doors are required, doors shall be listed and labeled for the fire rating shown on the plans.

Active leaf of double door shall have a full height astragal of 3 mm flat bar or folded sheet strip, not less than 1.5 mm thick (16-gage), welded on the outside of the active leaf.

Door shall be cleaned and treated by the bonderized process or approved phosphatizing process and then given one factory application of metal protective rust inhibitive primer. Primer shall not contain lead type pigments.

### **Glazing for doors**

Glazing for doors shall be ballistic resistant glass as specified under "Glazing" in Section 12-8, "Doors and Windows," of these special provisions.

### **Pressed metal frame**

Pressed metal frame shall be not less than 1.5 mm thick (16-gage) sheet steel with integral stop, mitered corners, face welded and ground smooth corners. Frames shall be reinforced for all hardware and shall be cleaned and treated by the bonderized process or an approved phosphatizing process and then given one factory application of metal protective rust inhibitive primer. Primer shall not contain lead type pigments.

Frames for fire rated doors shall be listed for the same rating shown on the plans for fire rated doors.

### **Sealants**

Sealants shall be ultraviolet and ozone resistant, gun grade polysulfide or polyurethane, multicomponent, Federal Specification: TT-S-227.

## **EXECUTION**

**INSTALLATION.**--Doors and frames shall be installed rigidly, securely, plumb and true and in such a manner that the doors operate freely without rubbing or binding. Clearance between frame and door shall be not more than 3 mm. The exterior frame shall be sealed weathertight.

Pressed metal frames shall be secured with clips and anchors as shown on the plans.

Fire rated assemblies shall be installed according to the manufacturer's recommendations.

Fire rated assemblies shall include doors, door frames, automatic smoke-actuated closers, self-closing mechanisms, panic hardware, wire glass, and fire rated louvers. Assemblies shall be approved by the California State Fire Marshal.

**PAINTING.**--Except for the primer application specified herein, doors and frames shall be cleaned, prepared and painted in accordance with the requirements specified under "Painting" in Section 12-9, "Finishes," of these special provisions.

### **12-8.02 ACCESS DOORS**

**GENERAL.**--This work shall consist of furnishing and installing access doors in accordance with the details shown on the plans and these special provisions

**SUBMITTALS.**--Manufacturer's descriptive data and installation instructions shall be submitted for approval.

## **PRODUCTS**

### **Access doors**

Access doors shall be factory assembled and factory prime painted steel. Door panel shall be 1.90 mm thick (14-gage) and door frame shall be 1.5 mm thick (16-gage) . The door and frame assembly shall have standard screw driver operated cam locks, concealed springs or continuous piano hinge and inside release handle. Access doors shall be by Babcock-Davis Hatchways, Bar-Co Access Doors, Inryco-Milcor, J.L. Industries, or equal.

## **EXECUTION**

**INSTALLATION.**--Access doors shall be installed in accordance with the manufacturer's recommendations. The access door assemblies shall be painted to match the color of the adjacent surrounding surfaces.

## **12-8.03 WINDOWS**

### **PART 1.- GENERAL**

**SUMMARY.**--This work shall consist of furnishing and installing windows in accordance with the details shown on the plans and these special provisions.

Windows shall be commercial (C) grade aluminum prime windows unless otherwise shown on the plans.

Windows shall meet the requirement of NAFS-1, "Voluntary Performance Specification for Windows, Skylights, and Glass Doors," and shall meet the C30 (Commercial) product designation unless otherwise shown on the plans. Windows shall be labeled with the AAMA label.

Finish for windows shall be Architectural Class I, clear anodized finish meeting American Architectural Manufacturer's Association Standard 611 unless otherwise shown on the plans.

Glazing for windows shall be ballistic resistant glass in accordance with the requirements specified under "Glazing" in Section 12-8, "Doors and Windows," of these special provisions.

**CERTIFICATES OF COMPLIANCE.**--Certificates of compliance shall be furnished for all windows in accordance with the requirements specified in Section 6-1.07, "Certificates of Compliance," of the Standard Specifications.

**SUBMITTALS.**--Manufacturer's descriptive data, installation instructions and schedule shall be submitted for approval.

Manufacturer's descriptive data and installation instructions shall show window elevations, plan views, full size sections, anchoring details to all substrates, anchors and hardware.

Installation schedule shall show location, size and type for each window.

### **PART 2.- PRODUCTS**

#### **Fixed windows**

Fixed windows shall be non-operable glazed panel inserted into a frame to include muntins, glazing stops, and glazing accessories.

#### **Aluminum**

Aluminum shall be extruded 6063-T5 aluminum alloy.

#### **Screws, fasteners and window accessories**

Screws, fasteners and window accessories shall be non-corrosive metals compatible with aluminum except guides and rollers may be vinyl and nylon respectively. Finish for locks, operators, strikes, keepers and other metal hardware shall match window finish.

**Weatherstripping**

Weatherstripping shall be continuous, replaceable type, wool pile mounted in metal or double runs of ultraviolet resistant neoprene or vinyl.

**Sealant**

Sealant shall be single-component, solvent type acrylic, self-leveling, non-sag, conforming to Federal Specification: TT-S-230.

**Tape**

Tape shall be compatible with sealant; Pecora, "B-44 Extra-Seal;" Pittsburg Plate Glass, "Duribbon;" Protective Treatment, "PTU 606;" Tremco, "440 Tape;" or equal.

**PART 3.- EXECUTION**

**FABRICATION.**--Frame and sash shall be accurately machined and fitted to hairline joinery that develops the members. Joints shall be factory sealed weathertight.

Sash shall be removable from the interior only. Sash shall have concealed condensation weeps to the outside.

**DELIVERY AND STORAGE.**--Windows shall be delivered in original, unopened, unbroken containers, wrappings, or bags with labels bearing the brand name, name of manufacturer or supplier, standard of manufacture, and product description.

Windows and accessories shall be stored off the ground, kept dry, fully protected from weather and damage

**INSTALLATION.**--Window units shall be set straight, level, and in true alignment in prepared openings. Windows shall be centered in openings. Clearance between the window unit and the building framing shall be from 4 mm to 6 mm at the sides and 13 mm at the top. Ventilator sash shall be adjusted after glazing for easy, smooth and proper operation.

The installation shall be flashed and sealed weathertight.

All aluminum surfaces in contact with masonry, steel or other incompatible materials shall be isolated with pressure sensitive tape, zinc chromate primer, bituminous paint or such other material recommended by the window manufacturer and approved by the Engineer.

**12-8.04 FINISH HARDWARE****PART 1.- GENERAL****SUMMARY**

This work shall consist of furnishing and installing hardware items for doors in accordance with the details shown on the plans and these special provisions.

Hardware for special doors and frames, if required, shall be as specified under "Hinged Doors" in Section 12-8 "Doors and Windows," of these special provisions.

Hardware assemblies shall comply with the fire code and the disabled accessibility requirements indicated on the plans and specified in these special provisions.

**SUBMITTALS**

Manufacturer's technical information and catalog cuts for each item of door hardware and a door hardware schedule shall be submitted for approval prior to installation.

Manufacturer's catalog cuts shall include catalog numbers, material, grade, type, size, function, design, quality and finish of hardware.

The door hardware schedule shall indicate the location and size of door opening, the door and frame material, and the size, style, finish and quantity of the hardware components required.

## **FINISHES**

Hardware shall be provided with standard US 32-D metal plated finish.

## **KEYING INSTRUCTIONS**

New facilities shall have a building master key system established.

Locks shall have cylinders with figure eight interchangeable cores with seven pin barrels. Permanent cores and keys shall be delivered to the Engineer for final installation at completion of project.

The Contractor shall also provide figure eight interchangeable cores for use during construction which shall remain the property of the State.

## **KEYING INSTRUCTIONS**

Key bows shall be stamped "US Coast Guard" and "Do Not Duplicate."

## **PART 2.- PRODUCTS**

### **GENERAL**

Door hardware equal in material, grade, type, size, function, design, quality and manufacture to that specified herein may be submitted for approval.

#### **Butt hinges**

Butt hinges shall be steel, 1 1/2-pair per door unless otherwise specified or shown on the plans. Nonremovable pins shall be provided at outswing exterior doors. Hinge size shall be 114 mm x 114 mm unless otherwise noted.

Heavy weight hinges shall be:

Hager	BB 1168
McKinney	T4B 37869
Stanley	BB 168
or equal.	

#### **Mortise Privacy Locksets**

Privacy Lockset: Privacy lockset shall be steel case with 32 mm x 203 mm face plate and 70 mm backset and shall conform to CBC Section 1115B.3.2.7. Door and frame preparation for privacy locksets shall conform to ANSI A115.1.

Lever operated mortise privacy lockset shall be:

Best	35H 6FW 15H
Falcon	LM521 DG
Schlage	L9453R x 06
or equal.	

**Kickplates**

Kickplates shall be 254 mm in height x 51 mm less than door width x 1.52 mm (16-gage).

Kickplates shall be:

Builders Brass	37X
Quality	48
Trimco	K0050
or equal.	

**Wall mounted door stop and holder**

Wall mounted door stop and holder shall be:

Builders Brass	W141X
Quality	36/136
Trimco	1207
or equal.	

**Thresholds, rain drips, door sweeps and door shoes**

Thresholds, rain drips, door sweeps and door shoes shall conform to the sizes and configurations shown on plans. Thresholds shall not exceed 13 mm in height, including thickness of any level change at openings.

Threshold, rain drip, door sweep and door shoe manufacturers shall be Pemko, Reese, Zero, or equal.

**Threshold bedding sealant**

Threshold bedding sealant shall conform to Federal Specification: SS-C-153.

**Weatherstrip and draft stop**

Weatherstrip and draft stop shall conform to the sizes and shapes shown on plans. Assemblies shall be UL listed and shall be provided where shown on the plans or as specified in these special provisions.

Weatherstrip and draft stop manufacturers shall be Pemko, Reese, Zero, or equal.

**Door signs and name plates**

Door signs and name plates shall be as specified under "Signs" in Section 12-10, "Specialties," of these special provisions.

**DOOR HARDWARE GUARD BOOTH****Overhead Track and Accessories**

Overhead track and accessories shall have one assembly per sliding door. Tracks shall be stainless steel, 2 hangers per sliding door. Hangers shall have bearings, rated for 150-pound minimum capacity. Wheel pendants shall be drop forged and equipped with hardened machined steel thrust rollers. All components shall be corrosion resistant to marine environment.

**Floor Mounted Door Guide**

Floor mounted door guide shall be stainless steel, angle 38 mm by 38 mm by 51 mm long with countersunk machine screw and expansion shield.

**PART 3.- EXECUTION**

**DOORS AND FRAMES.**--Doors and frames shall be set square and plumb and be properly prepared before the installation of hardware.

**INSTALLATION.**--Hardware items shall be accurately fitted, securely applied, and adjusted and lubricated in accordance with the manufacturer's instructions. Installation shall provide proper operation without bind or excessive play.

Hinges shall be installed at equal spacing with the center of the end hinges not more than 244 mm from the top and bottom of the door. Locksets, latchsets, privacy sets and panic exit mechanisms shall be 1024 mm from the finished floor. Kickplates shall be mounted on the push side of the doors, 25 mm clear of door edges.

Thresholds shall be set in a continuous bed of sealant material.

Door stops located on concrete surfaces shall be fastened rigidly and securely in place with expansion anchoring devices.

The location and inscriptions for door signs and name plates shall be as shown on the plans.

Hardware, except hinges, shall be removed from surfaces to be painted before painting.

Upon completion of installation and adjustment, the Contractor shall deliver to the Engineer all dogging keys, closer valve keys, lock spanner wrenches, and other factory furnished installation aids, instructions and maintenance guides.

**DOOR HARDWARE GROUPS AND SCHEDULE.**--Hardware groups specified herein shall correspond to those shown on the plans:

**GROUP 1 (Restroom)**

- 1 1/2-pair butt hinges
- 1 each lever operated mortise privacy lockset
- 1 each wall mounted door stop and holder
- 1 each rain drip
- 1 each threshold
- 1 each weatherstrip
- 1 each door sweep
- 1 each door shoe
- 1 each kickplate

**12-8.05 GLAZING**

**PART 1.- GENERAL**

**SUMMARY**

This work shall consist of furnishing and installing glazing in accordance with the details shown on the plans and these special provisions.

Glazing shall consist of glass and acrylic sheets for windows, doors and other glazed openings.

All glass shall conform to ASTM Designation: C 1036 and the classifications specified herein and shall be clear glass except as noted.

All acrylic sheets shall conform to ASTM Designation: D 702, Type III, Grade 3.

Safety glass shall be furnished and installed at all locations designated in Consumer Product Safety Commission's Safety Standard For Architectural Glazing Materials 16 CFR 1201.

**SUBMITTALS**

A detailed list of glazing materials including glass, sheet, sealants, tapes, setting blocks, shims, compression seals, and glazing channels shall be submitted for approval. The list shall include a schedule of the materials to be used at each location.

**LABELS**

Each individual pane of heat strengthened or fully tempered glass shall bear an identification label in accordance with ASTM Designation: C 1048.



## **PART 2.- PRODUCTS**

### **Safety glass**

Safety glass shall conform to Consumer Product Safety Commission Safety Standard For Architectural Glazing Materials: 16 CFR 1201, and ANSI Standard Z97.1 and shall be one of the following:

### **Laminated glass**

Laminated glass shall be safety glass, 6 mm minimum thickness, fabricated from 2 pieces of Type I, Class 1, Quality q4 or better glass fused to plastic interlayers.

### **Ballistic resistant glass**

Ballistic resistant glass shall be multiple laminated glass fused to plastic interlayers; 25 mm minimum thickness; rated UL 752 level III.

### **Tinted glass**

Tinted glass shall be evergreen; all the same tint.

### **Seals, caulks, putties, setting blocks, shims, tapes, compression seals, felt, spacers, and channels**

Seals, caulks, putties, setting blocks, shims, tapes, compression seals, felt, spacers, and channels shall be top grade, commercial quality, as recommended by the glass or sheet manufacturer and shall conform to the requirements in the publications of the Flat Glass Marketing Association.

## **PART 3.- EXECUTION**

### **INSTALLATION**

Glazing shall conform to the general conditions and applicable details in the publications of the Flat Glass Marketing Association.

Cut edges of tinted glass shall conform to the recommendations of the glass manufacturer. The glazier shall inspect each edge of tinted glass. Panes with edges that do not conform to the manufacturer's standards for tinted glass edges for sunny elevations shall not be used.

Panes shall be bedded fully and evenly, set straight and square within panels in such a manner that the pane is entirely free of any contact with metal edges and surfaces.

For all panes on the exterior of the building, the glazing on both sides of window panes shall provide a watertight seal and watershed. Seals shall extend not more than 2 mm beyond the holding members. A void shall be left between the vertical edges of the panes and the glazing channel. Weep systems shall be provided to drain condensation to the outside.

Panes in assemblies using extruded gasket glazing shall be set in accordance with the assembly manufacturer's instructions using gaskets and stops supplied by the manufacturer.

Laminated glass shall be set on setting blocks.

Whenever welding or burning of metal is in progress within 4.6 m of glazing materials, a protective cover shall be provided over exposed surfaces.

### **REPLACEMENT AND CLEANING**

All broken or cracked glass and glass with scratches which reduce the strength shall be replaced before completion of the project.

Panes shall be kept clean of cement and plaster products, cleansers, sealants, tapes and all other foreign material that may cause discoloration, etching, staining, or surface blemishes to the materials.

Excess sealant left on the surface of the glass or surrounding materials shall be removed during the work life of the sealant.

Solvents and cleaning compounds shall be chemically compatible with materials, coatings and glazing compounds to remain. Cleaners shall not have abrasives that scratch or mar the surfaces.

All panes shall be cleaned just before the final inspection. All stains and defects shall be removed. Paint, dirt, stains, labels (except etched labels), and surplus glazing compound shall be removed without scratching or marring the surface of the panes or metal work.

## SECTION 12-9. FINISHES

### 12-9.01 RESILIENT BASE

**GENERAL.**--This work shall consist of furnishing and installing resilient base in accordance with the details shown on the plans and these special provisions.

**SUBMITTALS.**--Manufacturer's descriptive data, installation instructions, color palette, and samples of resilient base shall be submitted for approval. Samples shall be not less than 50 mm in length.

#### PRODUCTS

##### Resilient base

Resilient base shall be manufacturer's best grade, rubber or vinyl base, with premolded internal and external corner pieces. The height and color shall be as shown on the plans.

##### Adhesive

Adhesive shall be as recommended by base manufacturer.

#### EXECUTION

**INSTALLATION.**--Bases shall be firmly and totally attached to walls with adhesive and shall be accurately scribed to trim, molding and cabinets. All joints shall be tight fitting. Bases between premolded corners or other termini may be installed continuous or installed using one m minimum standard manufactured lengths. Filler pieces shall be not less than 0.5 m.

### 12-9.02 EPOXY FLOOR TOPPING

#### PART 1 - GENERAL

Scope: This work shall consist of preparing surfaces for, and furnishing, and installing, epoxy flooring system suitable for marine environment, in conformance with the schedules and details shown on the plans and these special provisions.

The term "epoxy flooring system" as used in this section will include primer, aggregate-filled polyamine epoxy resin, and topcoat.

#### SUBMITTALS

**Product data.**--Manufacturer's descriptive data, Material Safety Data Sheets (MSDS), performance criteria, volatile organic compound (V.O.C.) data, and safety requirements.

**Sample.**--Sample shall be not less than 150 mm by 150 mm.

**Installation instructions.**--Manufacturer's current printed recommendations including instructions for storage, handling, surface preparation, priming, mixing, application, curing, and protection for epoxy flooring system.

**Maintenance instructions.**--Manufacturer's maintenance instructions, including maintenance procedures and materials, procedures for stain removal and surface repair, and recommended schedule for cleaning.

**Aggregate compatability certification.**--Written certification from the polyamine epoxy resin manufacturer confirming compatibility of aggregate with the epoxy flooring system proposed for use and warranty of finished product.

**Applicator experience letter.**--List of at least 3 completed projects demonstrating experience of epoxy flooring system applicator with proposed system. List shall include project name and location, name of material manufacturer, and approximate quantity of materials applied.

## **QUALITY ASSURANCE**

The Contractor is ultimately responsible for the workmanship and quality of the epoxy flooring system installation and compatibility of materials. Inspections by the Engineer or others do not limit the Contractor's responsibility.

Aggregate products shall be approved by the manufacturer of the polyamine epoxy resin as compatible as specified in "Submittals" of this section.

A Certificate of compliance shall be furnished for epoxy flooring system products in accordance with the requirements specified in Section 6-1.07, "Certificates of Compliance," of the Standard Specifications

## **REGULATORY REQUIREMENTS**

Coatings and applications shall conform to the rules for control of Volatile Organic Compound (VOC) emissions adopted by the air quality control district in the air basin in which the coatings are applied.

## **SITE ENVIRONMENTAL REQUIREMENTS**

Coatings shall be applied in conformance with the environmental constraints specified in the manufacturer's printed instructions. These conditions shall be maintained at least until the coating has cured.

Adequate lighting, as determined by the Engineer, shall be provided while surfaces are being prepared for coatings and during coating applications.

The Contractor shall take all precautions and implement all measures necessary to avert potential hazards associated with the self leveling epoxy flooring system materials as described on the pertinent Material Safety Data Sheets or container labels.

## **DELIVERY, STORAGE, AND HANDLING**

Products shall be delivered to the site in manufacturer's original unopened containers and stored in accordance with the manufacturer's instructions in an area designated solely for this purpose. All materials shall be protected from damage, moisture, direct sunlight and temperatures as designated by the manufacture. Container labeling shall include manufacturer's name, type of coating, trade name, batch number, shelf life date, color designation, drying time, and instructions for mixing, thinning and application.

## **PART 2 - PRODUCTS**

### **MATERIALS**

Primer: moisture tolerant, modified polyamine, penetrating epoxy primer

Intermediate: A high gloss, aggregate filled, high build, self-leveling epoxy topping

Topcoat: A chemical resistant urethane topcoat.

## **PART 3 - EXECUTION**

Surfaces scheduled to be coated shall be prepared in conformance with the manufacturer's printed instructions.

If between final surface preparation work and epoxy flooring system application, contamination of the prepared and cleaned substrates occurs, recleaning shall be required until the requirements of the manufacturer are met.

Each application of the epoxy flooring system shall be mechanically mixed, applied and cured in strict accordance with the printed instructions and at the application rates recommended by the manufacturer to achieve the dry film thickness stated in the coating technical data sheet.

The completed work shall be protected from water, airborne particles or other surface contaminants per the manufacturer's recommendations.

Upon completion of all operations, the coated surfaces shall be thoroughly cleaned of dust, dirt, grease, or other unsightly materials or substances.

Surfaces marred or damaged as a result of the Contractor's operations shall be repaired, at his expense, to match the condition of the surfaces prior to the beginning of the Contractor's operations.

### **12-9.03 PAINTING**

#### **PART 1 - GENERAL**

**SCOPE.--** This work shall consist of preparing surfaces to receive coatings, and furnishing and applying coatings, in conformance with the schedules and details shown on the plans and these special provisions.

The coatings specified in this section are in addition to any factory finishes, shop priming, or surface treatment specified elsewhere in these special provisions.

#### **DEFINITIONS**

**DETERGENT WASH.--** Removal of dirt and water-soluble chemicals by scrubbing with a solution of detergent and water, and removal of all solution and residues with clean water.

**HAND CLEANING.--** Removal of dirt, loose rust, mill scale, excess base material, filler, aluminum oxide, chalking paint, peeling paint, or paint that is not firmly bonded to the surfaces by using hand or powered wire brushes, hand scraping tools, power grinders, or sandpaper and removal of all loose particles and dust prior to coating.

**MILDEW WASH.--** Removal of mildew by scrubbing with a solution of detergent, hypochlorite-type household bleach, and warm water, and removal of all solution and residues with clean water.

#### **Abrasive Blasting:**

Removal of loosely adhering paint, dirt, rust, mill scale, efflorescence, weak concrete, or laitance, shall be by the use of airborne abrasives. Loose particles, dust, and abrasives shall be removed by blasting with clean, oil-free air.

Abrasives shall be limited to mineral grit, steel grit, or steel shot, and shall be graded to produce the surface profile recommended in the manufacturer's data sheet.

**STEAM CLEANING.--** Removal of oil, grease, dirt, or other foreign matter by using steam generated by commercial steam cleaning equipment, from a solution of water and steam cleaning compounds, and removal of all residues and cleaning compounds with clean water.

**TSP WASH.--** Removal of oil, grease, dirt, paint gloss, and other foreign matter by scrubbing with a solution of trisodium phosphate and warm water, and removal of all solution and residues with clean water.

**WATER BLASTING.--** Removal of dirt, loose scale, chalking, or peeling paint by low-pressure water cleaning. Water blasting shall be performed in conformance with the requirements in SSPC-SP12 and shall produce a surface cleanliness meeting the requirements of SSPC-SP12-WJ4. Equipment used shall have a minimum flow rate of 6.8 liters per minute. If a detergent solution is used, it shall be biodegradable and shall be removed from all surfaces with clean water.

**Protection:**

The Contractor shall provide protective devices, such as tarps, screens or covers, as necessary to prevent damage to the work and to other property or persons from all cleaning and painting operations.

Paint or paint stains on surfaces not designated to be painted shall be removed by the Contractor at the Contractor's expense and the original surface shall be restored.

**SUBMITTALS**

Manufacturer's descriptive data, a materials list, and color samples shall be submitted for approval.

Product descriptive data shall include product description, manufacturer's recommendations for product mixing, thinning, tinting, handling, site environmental requirements, product application, and drying time.

Materials list shall include manufacturer's name, trade name, and product numbers for each type coating to be applied.

Color samples shall be manufacturer's color cards, approximately 50 mm x 75 mm, for each color of coating shown on the plans. Color samples for stains shall be submitted on wood of the same species, color, and texture as the wood to receive the stain.

**QUALITY ASSURANCE**

**Certificates of Compliance:** Certificates of Compliance shall be furnished when products are required to conform with the requirements of The Society for Protective Coatings (SSPC) in conformance with the requirements specified in Section 6-1.07, "Certificates of Compliance," of the Standard Specifications.

**REGULATORY REQUIREMENTS**

Coatings and applications shall conform to the rules for control of Volatile Organic Compound (VOC) emissions adopted by the air quality control district in the air basin in which the coatings are applied.

**SITE ENVIRONMENTAL REQUIREMENTS**

Coatings shall be applied in conformance with the environmental constraints specified in the manufacturer's printed instructions. These conditions shall be maintained until the coating has cured and is ready for recoat.

Continuous ventilation shall be provided during application of the coatings.

Adequate lighting, as determined by the Engineer, shall be provided while surfaces are being prepared for coatings and during coating applications.

**DELIVERY, STORAGE, AND HANDLING**

Products shall be delivered to the site in sealed, labeled containers and stored in a well-ventilated area at an ambient air temperature of not less than 7°C. Container labeling shall include manufacturer's name, type of coating, trade name, color designation, drying time, and instructions for tinting, mixing, and thinning.

**MAINTENANCE STOCK**

Upon completion of coating work, a full 3.8 Liter container of each type and color of finish coat used shall be delivered to the location at the project site designated by the Engineer. Containers shall be tightly sealed and labeled with color, texture, and room locations where used, in addition to the manufacturer's standard product label.

## **PART 2 - PRODUCTS**

Products for each coating system shall be from a single manufacturer and shall conform to the requirements in the Detailed Performance Standards of the Master Painters Institute (MPI). Each product shall be shown on the MPI Approved Products List unless otherwise specified in these special provisions.

## **PART 3 - EXECUTION**

### **INSPECTION**

Coatings shall not be applied until surface preparation has been approved by the Engineer. The Contractor shall notify the Engineer at least 3 working days prior to the application of coatings.

### **SURFACE PREPARATION**

Surfaces scheduled to be coated shall be prepared in conformance with the coating manufacturer's printed instructions unless otherwise specified in these special provisions.

Hardware, cover plates, light fixture trim, and similar items shall be removed prior to preparing surfaces for coating. Following the application of the finish coating, the removed items shall be reinstalled in their original locations.

#### **Wood:**

A sealer recommended by the coating manufacturer shall be spot applied to knots, sap, pitch, tar, creosote, and other bleeding substances.

After the application of the prime coat, all nail holes, cracks, open joints, dents, scars, and surface irregularities shall be filled, hand cleaned, and spot primed to provide smooth surfaces for the application of finish coats.

#### **Galvanized Metal:**

New surfaces shall be roughened by hand sanding or light abrasive blasting. Galvanizing shall not be removed during cleaning or roughening.

Damaged or corroded areas shall be cleaned and given 2 spot applications of a coating that conforms to the requirements in the Detailed Performance Standards of the MPI, and listed on MPI List "Number 18, Primer, Zinc Rich, Organic."

**Steel and Other Ferrous Metals:** Surface shall be cleaned in conformance with the requirements in SSPC-SP 1. Surface profile shall be as required for the coating system specified.

**Concrete and Concrete Masonry Unit:** New material shall be cleaned and prepared in conformance with the requirements in SSPC-SP 13. Cracks and voids shall be filled with cement mortar patching material. Concrete shall be cured until the surface moisture is below the level specified in the coating manufacturer's printed instructions.

### **APPLICATION**

Coatings shall be applied in conformance with the printed instructions and at the application rates recommended by the manufacturer to achieve the dry film thickness stated in the coating technical data sheet.

Mixing, thinning and tinting shall conform to the manufacturer's printed instructions. After thinning, the coating shall conform to the regulatory requirements in these special provisions.

Coatings shall be applied only when surfaces are dry and properly prepared.

Cleaning and painting shall be scheduled so that dust and other contaminants from the cleaning process will not fall on wet, newly coated surfaces.

Materials required to be coated shall have coatings applied to all exposed surfaces, including the tops and bottoms of wood and metal doors, the insides of cabinets, and other surfaces not normally visible from eye level.

**Surface Finish Application:**

Each coat shall be applied to a uniform finish. Finished surfaces shall be free of surface deviations and imperfections such as skips, cloudiness, spotting, holidays, laps, brush marks, runs, sags, curtains, ropiness, improper cutting in, overspray, drips, ridges, waves, and variations in color and texture.

Each application of a multiple application finish system shall closely resemble the final color coat, except each application shall provide enough contrast in shade to distinguish the separate applications.

**Work Required Between Applications:**

Each application of material shall be cured in conformance with the coating manufacturer's printed instructions before applying the succeeding coating.

Enamels and clear finishes shall be lightly sanded, dusted, and wiped clean between applications.

Stain blocking primer shall be spot applied whenever bleeding substances are visible through the previous application of a coating.

**Timing of Applications:** The first application of the coating system shall be during the same work shift that the final surface preparation was performed. Additional coats shall be applied as soon as the required drying time of the preceding coat, specified in the coating manufacturer's printed instructions, has been met.

**Application Methods:**

Coatings shall be applied by brush, roller or spray. Rollers shall be of a type which do not leave a stippled texture in the paint film. Extension handles for rollers shall not be greater than 6 feet in length.

If spray methods are used, surface deviations and imperfections such as overspray, thickness deviations, lap marks, and orange peel shall be considered as evidence the work is unsatisfactory and the Contractor shall apply the remainder of the coating by brush or roller, as approved by the Engineer.

**Back Priming:**

The first application of the coating system shall be applied to all wood surfaces (face, back, edges, and ends) of wood materials that are not factory coated, immediately upon delivery to the project site. Surfaces of interior finish woodwork that adjoin concrete or masonry shall be coated with one application of exterior wood primer before installation.

**Finishing Mechanical and Electrical Components:**

Shop primed mechanical and electrical components shall be finish coated in conformance with the coating system specified for the substrate material. Louvers, grilles, covers, and access panels on mechanical and electrical components shall be removed and coated separately.

Interior surfaces of air ducts which are visible through grilles or louvers shall be coated with one application of flat black enamel, to limit of the sight line.

Conduit, piping, and other mechanical and electrical components visible in the finished work shall be painted.

Both sides and all surfaces, including edges and back of wood mounting panels for electrical and telephone equipment shall be finish coated before installing equipment.

## **CLEANING**

Upon completion of all operations, the coated surfaces shall be thoroughly cleaned of dust, dirt, grease, or other unsightly materials or substances.

Surfaces marred or damaged as a result of the Contractor's operations shall be repaired, at his expense, to match the condition of the surfaces prior to the beginning of the Contractor's operations.

## **COATING SYSTEM**

The surfaces to be coated shall be as shown on the plans and as specified in these special provisions. When a coating system is not shown or specified for a surface to be finish coated, the coating system to be used shall be as specified below for the substrate material. The number of applications specified for each coating system listed herein is a minimum. Additional coats shall be applied if necessary to obtain a uniform color, texture, appearance, or required dry film thickness.

### **SYSTEM 1 - CEMENT PLASTER AND CONCRETE**

2 Finish Coats:

Semi-Gloss: Latex, Exterior, MPI Gloss Level 5, MPI List Number 11

### **SYSTEM 2 - GALVANIZED METAL**

2 Finish Coats:

Semi-Gloss: Light Industrial coating, Water Based, Exterior, MPI Gloss Level 5, MPI List Number 163

### **SYSTEM 3 - STEEL AND OTHER FERROUS METALS, HIGHLY CORROSIVE ENVIRONMENT**

2 Prime Coats:

Coating meeting the requirements of SSPC-Paint 29

2 Finish Coats:

Semi-Gloss: Light Industrial coating, Water Based, Exterior, MPI Gloss Level 5, MPI List Number 163

### **SYSTEM 4 - WOOD, PAINTED**

1 Prime Coat:

Primer: Latex for Exterior Wood, MPI List Number 6

2 Finish Coats:

Semi-Gloss: Latex, Exterior, MPI Gloss Level 5, MPI List Number 11

## **COLOR SCHEDULE**

Colors shall be as shown on the plans.



## **12-9.04 SUSPENDED CEILINGS**

### **GENERAL**

This work shall consist of furnishing and installing suspended ceilings in accordance with the details shown on the plans and these special provisions.

Suspended ceilings shall consist of lay-in plastic parabolic louver panels and an exposed grid suspension system. Listed fire rated assemblies shall be installed where shown on the plans.

### **DESIGN**

The suspension system shall be designed to support the weight of ceiling panels and such other items, not mentioned, which are supported by the suspended ceiling system.

The deflection of any component of the suspension system shall not exceed 1/360 of the span.

The suspension system shall be designed for seismic restraint in accordance with ASTM Designation: E 580.

### **SUBMITTALS**

Manufacturer's descriptive data and installation instructions and complete working drawings of all supporting details, lateral force bracing, and runner and panel layouts shall be submitted for approval.

### **PRODUCTS**

#### **Parabolic louver panels**

Parabolic louver shall be one piece injection molded of polystyrene or acrylic base material with all parabolic surfaces prepared with a primary undercoat and a highly specular vacuum metalized finish. Louver panels shall have molded flange on all sides to fit 609 mm x 609 mm, with 38 mm x 38 mm x 25 mm parabolic cells, providing 31 degree shielding from all angles. Louvers shall have a luminaire efficiency of not less than 51.9% and a Visual Comfort Probability (VCP) index rating of not less than .93. Sizes are nominal.

#### **Suspension system**

Suspension system shall be galvanized steel, tee shaped main runners and cross runners and wall molding angles or channels conforming to ASTM Designation: C 635, heavy duty. Runners shall have exposed flanges approximately 14 mm wide and positive interlocks between main runners and cross runners. Wall moldings shall have a 50 mm wide exposed face.

#### **Wire hangers**

Wire hangers shall be 2.7 mm (12-gage) minimum, galvanized, soft-annealed, mild steel wire.

#### **Assembly devices, splices, intersection connectors and expansion devices**

Assembly devices, splices, intersection connectors and expansion devices shall be as recommended by the suspension system manufacturer.

### **EXECUTION**

### **INSTALLATION**

The suspended ceiling shall be installed square, level and true in accordance with the approved working drawings, the manufacturer's installation instructions and the requirements of ASTM Designations: C 636 and E 580 and UBC Standard No. 25-2.

Great care should be exercised when handling parabolic louvers, avoiding contact with oily and/or foreign substances. Louver panels shall always be handled with clean white gloves.

Hangers for the suspension system shall be spaced at not more than 1.2 m on centers and shall be saddle tied or wrapped around the main runner members.

Lighting fixtures, air terminals, services or other items shall be supported directly from the structure above.

The ceiling shall be leveled to within 3 mm in 3.6 m.

## **MAINTENANCE STOCK**

Upon completion of the suspended ceiling work, six plastic parabolic louver panels of the same size as installed shall be delivered to a location at the project site designated by the Engineer.

## **SECTION 12-10. SPECIALTIES**

### **12-10.01 SIGNS**

#### **PART 1.- GENERAL**

##### **SUMMARY**

**Scope.--**This work shall consist of furnishing and installing signs in accordance with the details shown on the plans and these special provisions.

##### **SUBMITTALS**

**Product data.--**Manufacturer's descriptive data for sign materials, colors and graphics, and for fastening hardware and material shall be submitted for approval.

#### **PART 2.- PRODUCTS**

##### **Plastic sign (restroom)**

Plastic sign for restroom shall be not less than 6 mm acrylic plastic. Sign background shall be blue and shall conform to Federal Standard 595B, Color No. 15090. Male/female symbol and lettering shall be white and shall conform to Federal Standard 595B, Color No. 17886.

Unisex restroom identification shall be a male and female symbol on a 305 mm equilateral triangle superimposed on a 305 mm diameter circle.

##### **Fastening hardware and material**

Fastening hardware and material shall be as recommended by the sign manufacturer. Fasteners shall be noncorrosive.

#### **PART 3.- EXECUTION**

**Inscription.--**Except for loft and exit signs, sign messages shall be as shown on the plans.

**Installation.--**Plastic signs for restrooms shall be fastened or secured to clean, finished surfaces in accordance with the sign manufacturer's instructions. Signs shall be installed at a location and height as shown on the plans.

Fastening hardware and material shall be installed within the sign as shown on the plans.

### **12-10.02 TOILET AND SHOWER ACCESSORIES**

#### **PART 1.- GENERAL**

**Scope.--**This work shall consist of furnishing and installing toilet and shower accessories in accordance with the details shown on the plans and these special provisions.

## **SUBMITTALS**

**Product data.**--Manufacturer's descriptive data and installation instructions and details shall be submitted for approval.

## **QUALITY ASSURANCE**

**Regulatory Requirements:** Accessibility products shall conform to Accessibility to Public Buildings, Public Accommodations, Commercial Buildings and Publicly Funded Housing, 24 CA Code of Regs Pt 2 §§ 1101B-1135B. Grab bars shall conform to Grab bars, tub and shower seats, 24 CA Code of Regs Pt 2 § 1115B.7.

**Certificates of Compliance:** Certificate of Compliance shall be furnished for grab bars and folding shower seat in conformance with the provisions in Section 6-1.07, "Certificates of Compliance," of the Standard Specifications. Certificate of Compliance shall include written confirmation that the grab bars, backing, mounting devices, fasteners and their installation conform to the requirements in Structural strength, 24 CA Code of Regs Pt 2 § 1115B.7.2.

## **PART 2.- PRODUCTS**

### **Toilet tissue dispenser**

Toilet Tissue Dispenser: Toilet tissue dispenser shall be dual roll, surface mounted, stainless steel with satin finish, and approximately 150 mm x 290 mm x 150 mm deep. Dispenser shall utilize standard toilet tissue rolls. The top roll shall automatically drop into place after the bottom roll is depleted. One dispenser per toilet stall.

### **Combination paper towel dispenser and waste receptacle**

Combination paper towel dispenser and waste receptacle shall be semi-recessed unit of stainless steel with satin finish. The approximate size shall be 355 mm x 1880 mm x 190 mm deep with 102 mm skirt. The paper towel dispenser shall have a capacity of 1000 single fold paper towels. The waste receptacle shall have a capacity of not less than 37 liters. One unit per lavatory.

### **Toilet seat cover dispenser**

Toilet seat cover dispenser shall be white plastic dispenser, approximately 210 mm x 320 mm x 48 mm deep, single pack. One dispenser per toilet stall.

### **Paper towel dispenser**

Paper towel dispenser shall be white enameled sheet steel towel dispenser with a capacity of 1000 single fold paper towels. One dispenser per lavatory.

### **Liquid soap dispenser**

Liquid soap dispenser shall be surface mounted, heavy duty plastic dispenser for industrial use with a capacity of at least 710 mL. One dispenser per lavatory.

### **Mirror, wall hung with shelf**

Mirror, wall hung shall be Number 1 quality, 6 mm thick, electrolytically copper plated float or plate glass mirror with nonmoisture-absorbing filler. Mirror shall have a heavy gage galvanized steel back and stainless steel frame with integral 127 mm wide stainless steel shelf. The frame shall have a satin finish and shall be mitered and welded and the corners shall be ground smooth. Fasteners shall not penetrate surfaces of the frame exposed to view. Mirror shall conform to Federal Specification: DD-M-411b and shall be guaranteed against silver spoilage for not less than 10 years.

### **Steel grab bars**

Steel grab bars shall be stainless steel, 38 mm diameter bars and escutcheon covered integral mounting flanges.

### **PART 3.- EXECUTION**

**Installation.--**Toilet and shower accessories shall be installed in accordance with the manufacturer's recommendations. Fasteners for mounting accessories shall be concealed and tamper proof.

Expansion anchors shall be used for mounting accessories on masonry or concrete walls.

Toilet and shower accessories shall be mounted after painting work is complete.

All toilet room accessories shall be mounted plumb, secure and rigid. Grab bars shall be supported adequately so the bars will withstand an applied load of 113 kg at any point.

#### **SECTION 12-11. (BLANK)**

#### **SECTION 12-12. (BLANK)**

#### **SECTION 12-13. (BLANK)**

#### **SECTION 12-14. (BLANK)**

#### **SECTION 12-15. MECHANICAL**

##### **12-15.01 MECHANICAL WORK**

###### **GENERAL**

**Scope.--**This work shall consist of performing mechanical work in accordance with the details shown on the plans and these special provisions.

Mechanical work shall include furnishing all labor, materials, equipment and services required for providing heating, ventilating, air conditioning, and plumbing distribution systems.

Earthwork, foundations, sheet metal, painting, electrical, and such other work incidental and necessary to the proper installation and operation of the mechanical work shall be in accordance with the requirements specified for similar type work elsewhere in these special provisions.

System layouts are generally diagrammatic and location of equipment is approximate. Exact routing of pipes, ducts, etc., and location of equipment is to be governed by structural conditions and obstructions. Equipment requiring maintenance and inspection is to be readily accessible.

Roof penetrations shall be flashed and sealed watertight in accordance with the requirements specified under "Sheet Metal Flashing" in Section 12-7, "Thermal and Moisture Protection," of these special provisions.

###### **SUBMITTALS**

**Product data.--**A list of materials and equipment to be installed, manufacturer's descriptive data, and such other data as may be requested by the Engineer shall be submitted for approval.

Manufacturer's descriptive data shall include complete description, performance data and installation instructions for the materials and equipment specified herein. Control and wiring diagrams, rough-in dimensions for plumbing fixtures, and component layout shall be included where applicable.

Manufacturer's descriptive data shall be submitted for the following:

- Heat pump unit
- Electric wall heater
- Electric water heater
- Water closet
- Lavatory
- Carriers (for above)
- Flush valve
- Lavatory Faucets
- Exhaust fan
- Hose Faucets
- Tempering Valve

Floor Drain  
Water Piping  
Sewer Piping

## **CLOSEOUT SUBMITTALS**

**Operation and maintenance manuals.**--Prior to the completion of the contract, 3 identified copies of the operation and maintenance instructions with parts lists for the equipment specified herein shall be delivered to the Engineer at the jobsite. The instructions and parts lists shall be indexed and bound in a manual form and shall be complete and adequate for the equipment installed. Inadequate or incomplete material shall be returned. The Contractor shall resubmit adequate and complete manuals at no expense to the State.

Operation and maintenance manuals shall be submitted for the following equipment:

Heat pump unit  
Electric water heater  
Water closet  
Lavatory  
Flush valve  
Lavatory Faucets  
Exhaust fan  
Hose Faucets  
Tempering Valve  
Floor Drain  
Electric wall heater

## **QUALITY ASSURANCE**

**Codes and standards.**--Mechanical work, including equipment, materials and installation, shall conform to the CBC, CMC, and to the California Code of Regulations, Title 8, Chapter 4, Division of Industrial Safety (DIS).

## **WARRANTY**

**Warranties and guarantees.**--Manufacturer's warranties and guarantees for materials or equipment used in the work shall be delivered to the Engineer at the jobsite prior to acceptance of the contract.

## **SYSTEM IDENTIFICATION**

**Piping, ducts, valves and equipment.**--Identification of piping, valves and equipment shall be as shown on the plans or these special provisions:

**Equipment.**--All equipment shall be identified with a plastic laminated, engraved nameplate which bears the unit mark number as indicated on the drawings (for example, AC-4). Provide 13 mm high lettering, white on black background. Nameplates shall be permanently secured to the unit.

## **12-15.02 PIPE, FITTINGS AND VALVES**

### **PART 1.- GENERAL**

#### **SUMMARY**

**Scope.**--This work shall consist of furnishing and installing pipes, fittings and valves in accordance with the details shown on the plans and these special provisions. Pipe, fittings and valves shall include such plumbing and piping accessories and appurtenances, not mentioned, that are required for the proper installation and operation of the plumbing and piping systems.

All piping insulation and wrapping material shall be in accordance with the requirements specified under "Mechanical Insulation," in this Section 12-15.

Cathodic protection for underground piping shall be in accordance with the requirements specified under "Cathodic Protection," in Section 12-16, "Mechanical," of these special provisions.

The pipe sizes shown on the plans are nominal pipe size. No change in the pipe size shown on the plans shall be permitted without written permission from the Engineer.

The pipe and fitting classes and material descriptions shall be as specified herein. No change in class or description shall be permitted without written permission from the Engineer.

## **QUALITY ASSURANCE**

**Codes and standards.**--Pipe, fittings and valves shall be installed in accordance with the requirements in the CPC, the manufacturer's recommendations and the requirements specified herein.

## **PART 2.- PRODUCTS**

### **MATERIALS**

#### **PIPE AND FITTINGS**

<b>Class</b>	<b>Description</b>
--------------	--------------------

##### **A1**

Schedule 40 galvanized steel pipe conforming to ASTM Designation: A 53, with 1040 kPa galvanized malleable iron banded screwed fittings and galvanized steel couplings. The weight of the zinc coating shall be not less than 90 percent of that specified in ASTM Designation: A 53.

##### **A2**

Schedule 40 galvanized steel pipe conforming to ASTM Designation: A 53, with black cast iron recessed drainage fittings. For rainwater leaders, neoprene-gasket compression couplings, Smith Blair, Dresser, or equal, may be used. The weight of the zinc coating shall be not less than 90 percent of that specified in ASTM Designation: A 53.

##### **A3**

Schedule 5 steel pipe conforming to ASTM Designation: A 135 with pressfit fittings and couplings for service as designated.

##### **A4**

Pipe and fittings shall be UL or FM listed, ferrous (Schedule 20 minimum) or copper (Type L minimum), suitable for the working pressure involved but not less than 1210 kPa. Pipe and fittings shall be in accordance with National Fire Protection Association (NFPA 13-2002) Code requirements.

##### **B1**

Schedule 40 black steel pipe conforming to ASTM Designation: A 53, with screwed fittings suitable for working pressure involved, but not less than 1210 kPa.

##### **B2**

Schedule 40 black steel pipe conforming to ASTM Designation: A 53, with 1040 kPa black malleable iron banded screwed fittings and black steel couplings.

Steel pipe coating, where required, shall be factory applied plastic. Pipe coating shall be Standard Pipe Protection, X-Tru-Coat (0.50 mm thick); Pipe Line Service Corporation, Republic; 3M Company, Scotchkote 205 (0.30 mm thick); or equal.

##### **B3**

Schedule 80 black steel pipe conforming to ASTM Designation: A 53 grade B, 50 mm and smaller shall be 20 700 kPa WOG socket welding fittings and couplings or 13 800 kPa WOG threaded forged steel, ASTM Designation: A 105. 65 mm and larger shall be extra strong weight butt welding fittings and couplings.

**C1**

Hub and plain end cast iron soil pipe with neoprene gaskets conforming to Cast Iron Soil Pipe Institute's Standard 301. Pipe, fittings and gaskets shall be of one manufacturer.

**C2**

Hubless cast iron soil pipe with neoprene gaskets, corrugated stainless steel shields and stainless steel clamps conforming to Cast Iron Soil Pipe Institute's Standard 301. Joint materials shall be furnished by pipe manufacturer.

**D1**

Ductile iron push on joint pipe conforming to AWWA Designation: C151. Fittings shall be push on ductile iron conforming to AWWA Designation: C153. Joints shall be rubber gasketed and designed for a working pressure of 2420 kPa. Pipe and fittings shall be supplied with bituminous outer coating and cement lining.

**H1**

Type DWV hard copper tubing conforming to ASTM Designation: B 306, with DWV drainage fittings, stop type couplings and threaded adapters.

**H2**

Type K hard copper tubing conforming to ASTM Designation: B 88, with wrought copper or cast bronze solder joint pressure fittings, stop type couplings and threaded adapters. Solder shall be lead-free.

**H3**

Type L hard copper tubing conforming to ASTM Designation: B 88, with wrought copper or cast bronze solder joint pressure fittings, stop type couplings and threaded adapters. Solder shall be lead-free.

**P1**

Polyvinyl chloride (PVC) gravity sewer plastic pipe and fittings conforming to ASTM Designation: D 3034, Standard Dimension Ratio (SDR) 35, with integral bell and bell and spigot rubber gasketed joints or conforming to ASTM Designation: D2665 with solvent welded fittings. Rubber gaskets shall conform to ASTM Designation: F 477. Stainless steel clamps with rubber boots shall not be used.

**P2**

Polyvinyl chloride (PVC) plastic pipe and fittings conforming to ASTM Designation: D 2241, Type I, Grade 1, Standard Dimension Ratio (SDR) 21, rated for 1380 kPa working pressure at 23°C, National Sanitation Foundation approved. Pipe shall have bell ends conforming to ASTM Designation: D 3139 with triple edge rubber sealing ring. For pipe sizes 50 mm diameter and smaller, plain end pipe with solvent welded fittings ASTM Designation: D 2241, Type I, Grade 1, Standard Dimension Ratio (SDR) 21, rated for 1380 kPa may be used.

**P3**

Polyvinyl chloride (PVC) standard weight pipe and fittings, Schedule 40, conforming to ASTM Designation: D 1785. Pipe shall meet or exceed requirements of National Sanitation Foundation Standard No. 14. Pipe shall have bell ends conforming to ASTM Designation: D 2672. For pipe sizes 75 mm and smaller, plain end pipe with solvent welded fittings conforming to ASTM Designation: D 2241, may be used.

**P4**

Polyvinyl chloride (PVC) plastic pipe and fittings shall conform to AWWA Designation: C900, class 150, Standard Dimension Ratio (SDR) 18. Pipe shall have bell end with a solid cross section elastomeric ring conforming to ASTM Designation: D 1869.

**P5**

Polyethylene plastic gas pipe and fittings conforming to ASTM Designation: D 1248 and D 2513 with Standard Dimension Ratio (SDR) 11, rated for 415 kPa working pressure at 23°C, socket type fittings, joined by heat fusion.

**P6**

Polyvinyl chloride (PVC) natural gas pipe, Class 315, conforming to ASTM Designation: D 2513. Fittings shall be Schedule 40 conforming to ASTM Designation: D 2513, and shall be primed and glued. Primer shall conform to ASTM Designation: F656. Solvent cement shall conform to ASTM Designation: D2564. Approved adapters shall be used for transition to other pipe materials.

**P7**

Cross-linked Polyethylene tube (PEX) with oxygen barrier conforming to ASTM Designation: F876/F877 and International Standard 9001. Tubing shall be flexible thermoplastic type rated for 690 kPa working pressure at 82°C. Tube shall have a 25-year warranty.

**Unions (for steel pipe)**

Unions (for steel pipe) shall be 1730 kPa, threaded malleable iron, ground joint, brass to iron seat, galvanized or black to match piping.

**Unions (for copper or brass pipe)**

Unions (for copper or brass pipe) shall be 1040 kPa cast bronze, ground joint, bronze to bronze seat with silver brazing threadless ends or 860 kPa cast brass, ground joint, brass to brass seat with threaded ends.

**Unions (for brass waste and flush pipes)**

Unions (for brass waste and flush pipes) shall be slip or flange joint unions with soft rubber or leather gaskets. Unions shall be placed on the fixture side of the traps.

**Dielectric waterway**

Dielectric waterway shall be a premanufactured unit that incorporates an insulated interior lining at least 75 mm in length between the 2 pipes being connected while maintaining metal to metal contact on the exterior surface. Dielectric water way shall be listed by IAPMO (International Association of Plumbing and Mechanical Officials).

**Insulating union**

Insulating union or flange as applicable shall be suitable for the service on which used. Connections shall be constructed such that the 2 pipes being connected are completely insulated from each other with no metal to metal contact. Insulating couplings shall not be used. Insulating union shall be F. H. Maloney; Central Plastics; EPCO; or equal.

**Insulating connection (to hot water tanks)**

Insulating connection (to hot water tanks) shall be 150 mm minimum, flexible copper tubing with dielectric union at each end and designed to withstand a pressure of 1040 kPa and a temperature of 93°C.

**VALVES****Gate valve (65 mm and smaller)**

Gate valve (65 mm and smaller) shall be bronze body and trim, removable bonnet and non rising stem, Class 125 and same size as pipe in which installed. Gate valve shall be Crane, 438; Nibco Scott, T-113; Jenkins, 370; or equal.

Gate valve in nonferrous water piping systems may be solder joint type with bronze body and trim. Valve shall be Kitz, 59; Nibco Scott, S-113; Jenkins, 1240; or equal.



**Ball valve**

Ball valve shall be two piece, minimum 2760 kPa WOG, bronze body and chrome plated or brass ball with full size port. Valve shall be Nibco Scott, T-580; Watts, B-6000; Kitz, 56; or equal.

**Check valve (40 mm and smaller)**

Check valve (40 mm and smaller) shall be silent spring loaded type, threaded bronze body, nylon or teflon disc, beryllium or stainless steel helical spring and shaft, Class 125 and same size as pipe in which installed. Check valve shall be Nibco/Scott, T-480; CPV, 36; Kitz, 26; or equal.

**Pressure reducing valve (PRV)**

Pressure reducing valve (PRV) shall be direct acting, spring loaded diaphragm type control valve with balanced single seat, bronze body, bronze trim and screwed connection. PRV shall be completely self-contained and shall require no external sending pipes or outside control medium. The outlet pressure of the PRV shall be adjustable within a range of 170 kPa to 400 kPa.

**FAUCET AND HYDRANTS****Hose faucet**

Hose faucet shall be compression type, angle pattern, wall flange at exterior locations, tee handle, 20 mm female thread with hose end, rough chrome or nickel plated finish for locations inside building, rough brass finish for others. Hose faucet shall be supplied with an integral or nonremovable threaded outlet vacuum breaker which meets the requirements of the American Society of Sanitary Engineering (ASSE) Standard: 1011. Hose faucet shall be Nibco, No. 63VB; Chicago, No. 13T; or equal.

**Wall hydrant**

Wall hydrant shall be 20 mm, exposed, nickel bronze head with bronze casing, and integral vacuum breaker. Operating key shall be provided. Wall hydrant shall be J. R. Smith, Model 5609 QTSAP; Josam, Model 71070; Wade, Model 8630-89; or equal.

**Box hydrant**

Box hydrant shall be 20 mm, nickel bronze box with hinged, locking cover, bronze casing and hydrant, integral vacuum breaker and minimum 7 mm drain port. Operating key shall be provided. Box hydrant shall be J. R. Smith, Model 5709 QTSAP; Josam, Model 71020; Zurn, Model 1330; or equal.

**CLEANOUTS****Cleanout through wall**

Cleanout through wall shall be cast iron cleanout tee type with polished stainless access plates. Plug shall be countersunk brass or bronze with tapered threads. Cleanout shall be Wade, No. W-8460; Smith, No. 4532; Zurn, No. 1445; or equal.

**Cleanout through floor**

Cleanout through floor shall have nonslip scoriated nickel bronze access plate and adjustable frame with square pattern top for ceramic tile and round pattern top for other finishes. Where floors are constructed with a membrane, access frame shall be provided with membrane clamping flange. Plug shall be countersunk brass or bronze with tapered threads. Cleanout shall be Wade, W-7000 Series; Smith, 4023 Series; Zurn, No. 1400; or equal.

Cleanout through floors in exterior locations shall be heavy duty, floating pipe type with cast iron cover. Cleanouts shall be Wade, No. W-8300-HF; Smith, No. 4253; Zurn, No. 1474; or equal.

**Cleanout to grade**

Cleanout to grade shall be cast iron ferrule type. Plug shall be countersunk brass or bronze with tapered threads. Cleanout to grade shall be Wade, No. W-8450; Smith, 4420; Zurn, No 1440; or equal.

## **MISCELLANEOUS ITEMS**

### **Water hammer arrestor**

Water hammer arrestor shall be stainless steel body with bellows or piston. Arrestor compression chambers shall be pneumatically charged. Water hammer arrestors shall be tested and certified in accordance with the Plumbing and Drainage Institute Standard: PDI-WH201 and sized as shown on the plans.

### **Access door**

Access door shall be 1.52 mm prime coated steel, face mounting square frame, minimum 300 mm x 300 mm door with concealed hinge and screwdriver latch.

### **Compression stop (exposed)**

Compression stop (exposed) shall be metal full free waterway, angle type, ground joint union, non-rising stem, molded rubber seat and wheel handle.

### **Compression stop (concealed)**

Compression stop (concealed) shall be long neck, built-in compression stops for required wall thickness, loose key and exposed parts polished chromium plated. Supplies shall be Chicago, 1771; California Brass, No. 172; or equal.

### **Pressure gages (for PRV)**

Pressure gages (for PRV) shall have 0 to 700 kPa scale with 80 mm minimum diameter dial. Gages shall be installed within 150 mm of the inlet and outlet sides of the pressure reducing valve. Pressure gages shall be provided with a brass gage cock.

### **Wye strainer**

Wye strainer shall be wye pattern, cast iron body and Type 304 stainless steel or monel strainer screen. The strainer screen shall have an open area equal to at least 3 times the cross sectional area of the pipe in which it is installed and shall be woven wire fabric with 20 mesh or perforated sheet with 850 micron maximum diameter holes.

### **Pipe hanger (for piping supported from overhead)**

Pipe hanger (for piping supported from overhead) shall be Grinnell, Model 269; Super Struct, C711; or equal.

### **Pipe wrapping tape and primer**

Pipe wrapping tape shall be pressure sensitive polyvinyl chloride or pressure sensitive polyethylene tape having nominal thickness of 0.50 mm. Wrapping tape shall be Polyken, 922; Manville, Trantex VID-20; Scotchrap, 51; or equal.

Pipe wrapping primer shall be compatible with the pipe wrapping tape used.

### **Floor, wall, and ceiling plates**

Floor, wall, and ceiling plates shall be chromium plated steel or plastic plates having screw or spring clamping devices and concealed hinges. Plates shall be sized to completely cover the hole.

### **Valve box**

Valve box shall be precast high density concrete with polyethylene face and cast iron traffic rated cover marked "WATER," "GAS" or "CO-SS" as applicable. Extension shall be provided as required. Valve box shall be Christy, B3; Brooks Products Company, 3TL; Frazer, 3; or equal.

### **Roof drain**

Roof drain shall be cast iron body, with integral flashing clamp and gravel stop with seepage openings, 400 mm nominal polyethylene low profile dome, 75 mm caulk or no-hub outlet and underdeck clamp. Roof drain shall be J. R. Smith, 1010; Zurn, Z-100; Wade, W-3500; or equal.

**Floor drain**

Floor drain shall be cast iron body and flashing collar, adjustable nickel bronze 150 mm strainer head with seepage openings and caulk or no-hub outlet. Floor drain shall be round or square as shown on the Architectural plans. Floor drain shall be J. R. Smith, 2005/2010; Wade, W-1100; Zurn, Z-415; or equal.

**PART 3.- EXECUTION****INSTALLATION****INSTALLATION OF PIPES AND FITTINGS**

**Pipe and fittings.**--Pipe and fittings shall be installed in accordance with the following designated uses:

Designated Use	Pipe and Fitting Class
Domestic water (CW and HW) in buildings	H3 or A1
Domestic water underground within 1.5 m of the building	A1 or H2
Domestic water underground 1.5 m beyond the building	P2, P3, P4, A1 or H2
Sanitary drain piping above ground in building	H1, C1, or C2
Sanitary drain and vent piping underground within 1.5 m of the building	C1 or C2
Sanitary vent piping above ground in building	A2, H1, C1, or C2
Sanitary drain pipe, 1.5 m beyond the building	C1, C2, or P1

**Installing piping.**--Water piping shall be installed generally level, free of traps and bends, and arranged to conform to the building requirements.

Piping installed underground shall be tested as specified elsewhere in these special provisions before backfilling.

Public use areas, offices, rest rooms, locker rooms, crew rooms, training rooms, storage rooms in office areas, hallway type rooms, and similar type use areas shall have concealed piping.

Warehouse rooms, equipment bays, and loft areas shall have exposed piping.

Piping shall not be run in floor fill, except as shown on the plans.

Piping shall be installed parallel to walls. All obstructions shall be cleared, headroom preserved and openings and passageways kept clear whether shown or not. Piping shall not interfere with other work.

Where pipes pass through exterior walls, a clear space around pipe shall be provided. Space shall be caulked water tight with silicone caulk.

Underground copper pipe shall have brazed joints. Underground plastic pipe shall be buried with No. 14 solid bare copper wire. Wire ends at pipe ends shall be brought up 200 mm and looped around pipe.

Exposed supply and drain piping in rest rooms shall be chrome finished.

Forty-five degree bends shall be used where offsets are required in venting. Vent pipe headers shall be sloped to eliminate any water or condensation.

Vent piping shall extend a minimum of 200 mm above the roof.

Horizontal sanitary sewer pipe inside buildings shall be installed on a uniform grade of not less than 2 percent unless shown otherwise on the plans.

Drainage pipe shall be run as straight as possible and shall have easy bends with long turns.

Wye fittings and 1/8 or 1/16 bends shall be used where possible. Long sweep bends and combination Wye and 1/8 bends may be used only for the connection of branch pipes to fixtures and on vertical runs of pipe.

**Water pipe near sewers.**--Water pipe shall not be installed below sewer pipe in the same trench or at any crossing, or below sewer pipe in parallel trenches less than 3 m apart.

When a water pipe crosses above a sewer pipe, a vertical separation of at least 300 mm between the top of the sewer and the bottom of the water pipe shall be maintained.

When water and sewer pipe is installed in the same trench, the water pipe shall be on a solid shelf at least 300 mm above the top of the sewer pipe and 300 mm to one side.

**Pipe sleeves.**--The Contractor shall provide sleeves, inserts and openings necessary for the installation of pipe, fittings and valves. Damage to surrounding surfaces shall be patched to match existing.

PVC pipe sleeves shall be provided where each pipe passes through concrete floors, footings, walls or ceilings. Inside diameter of sleeves shall be at least 20 mm larger than outside diameter of pipe. Sleeves shall be installed to provide at least 10 mm space all around pipe the full depth of concrete. Space between pipes and pipe sleeves shall be caulked watertight.

**Cutting pipe.**--All pipe shall be cut straight and true and the ends shall be reamed to the full inside diameter of the pipe after cutting.

**Damaged pipe.**--Pipe that is cracked, bent or otherwise damaged shall be removed from the work.

**Pipe joints and connections.**--Joints in threaded steel pipe shall be made with teflon tape or a pipe joint compound that is nonhardening and noncorrosive, placed on the pipe and not in the fittings.

The use of thread cement or caulking on threaded joints will not be permitted. Threaded joints shall be made tight. Long screw or other packed joints will not be permitted. Any leaky joints shall be remade with new material.

Exposed polished or enameled connections to fixtures or equipment shall be made with special care, showing no tool marks or threads.

**Cleaning and closing pipe.**--The interior of all pipe shall be cleaned before installation. All openings shall be capped or plugged as soon as the pipe is installed to prevent the entrance of any materials. The caps or plugs shall remain in place until their removal is necessary for completion of the installation.

**Securing pipe.**--Pipe in the buildings shall be held in place by iron hangers, supports, pipe rests, anchors, sway braces, guides or other special hangers. Material for hangers and supports shall be compatible with the piping or neoprene isolators shall be used. Allowances shall be made for expansion and contraction. Steel pipe shall have hangers or supports every 3 m. Copper pipe 25 mm or smaller shall have hangers or supports every 2 m and sizes larger than 25 mm shall have hangers or supports every 3 m. Plastic pipe shall have hangers or supports every 1 m. Cast iron soil pipe with neoprene gaskets shall be supported at each joint. Vertical pipes shall be supported with clamps or straps. Horizontal and vertical piping shall be securely supported and braced to prevent swaying, sagging or flexing of joints.

**Hangers and supports.**--Hangers and supports shall be selected to withstand all conditions of loading to which the piping and associated equipment may be subjected and within the manufacturer's load ratings. Hangers and supports shall be spaced and distributed so as to avoid load concentrations and to minimize the loading effect on the building structure.

Hangers and supports shall be sized to fit the outside diameter of pipe or pipe insulation. Hangers shall be removable from around pipe and shall have provisions for vertical adjustment after erection. Turnbuckles may be used.

Materials for holding pipe in place shall be compatible with piping material.

Hanger rods shall be provided with locknuts at all threaded connections. Hanger rods shall be sized as follows:

Pipe Size	Minimum Hanger Rod Diameter
15 mm to 50 mm	10 mm
65 mm to 87 mm	13 mm
100 mm to 125 mm	16 mm
150 mm	19 mm

**Wrapping and coating steel pipe.**--Steel pipe buried in the ground shall be wrapped or shall be plastic coated as specified herein:

1. Wrapped steel pipe shall be thoroughly cleaned and primed as recommended by the tape manufacturer.
2. Tapes shall be tightly applied with 1/2 uniform lap, free from wrinkles and voids with approved wrapping machines and experienced operators to provide not less than 1.00 mm thickness.

3. Plastic coating on steel pipe shall be factory applied. Coating imperfections and damage shall be repaired to the satisfaction of the Engineer.
4. Field joints, fittings and valves for wrapped and plastic coated steel pipe shall be covered to provide continuous protection by puttying and double wrapping with 0.50 mm thick tape. Wrapping at joints shall extend a minimum of 150 mm over the adjacent pipe covering. Width of tape for wrapping fittings shall not exceed 50 mm. Adequate tension shall be applied so tape will conform closely to contours of fittings. Putty tape insulation compounds approved by the Engineer shall be used to fill voids and provide a smooth even surface for the application of the tape wrap.

Wrapped or coated pipe, fittings, and filed joints shall be approved by the Engineer after assembly. Piping shall be placed on temporary blocks to allow for inspection. Deficiencies shall be repaired to the satisfaction of the Engineer before backfilling or closing in.

**Thrust blocks.**--Thrust blocks shall be formed by pouring concrete between pipe and trench wall. Thrust blocks shall be sized and so placed as to take all thrusts created by maximum internal water pressure.

Plastic pipe underground shall be provided with thrust blocks and clamps at changes in direction of piping, connections or branches from mains 50 mm and larger, and all capped connections.

**Union.**--Unions shall be installed where shown and at each threaded or soldered connection to equipment and tanks. Unions shall be located so piping can be easily disconnected for removal of equipment or tanks. Unions shall be omitted at compression stops.

**Dielectric waterway.**--Dielectric waterway shall be provided between metal pipes of different material, and between brass or bronze valves and steel piping.

**Insulating union and insulating connection.**--Insulating union and insulating connection shall be provided where shown and at the following locations:

1. In metallic water, gas and air service connections into each. Insulating connections shall be installed on the exterior of the building, above ground and after shut-off valve.
2. In water, gas and air service connections in ground at point where new metallic pipes connect to existing metallic pipes. Install valve box above insulating connection.
3. At points of connections of copper or steel water pipes to steel domestic water heaters and tanks.
4. At each end of buried ferrous pipe protected by cathodic protection.

**Bonding at insulating connections.**--Interior water piping and other interior piping that may be electrically energized and are connected with insulating connections shall be bonded in accordance with the CEC. Bonding shall all be coordinated with electrical work.

**Compression stop.**--Each fixture, including hose faucets, shall be equipped with a compression stop installed on water supply pipes to permit repairs without shutting off water mains. Ball valves may be installed where shown on the plans or otherwise permitted by the Engineer.

## **INSTALLATION OF VALVES**

**Pressure reducing valve.**--A capped tee connection and strainer shall be installed ahead of the pressure reducing valve.

**Exterior valves.**--Exterior valves located underground shall be installed in a valve box marked "Water." Extensions shall be provided as required.

## **INSTALLATION OF FAUCETS AND HYDRANTS**

**Hose faucet and hydrants.**--Faucets and hydrants shall be installed with outlets 0.5 m above finished grade.

## INSTALLATION OF CLEANOUTS

**Cleanouts.**--A concrete pad 0.5 m long and 100 mm thick shall be placed across the full width of trench under cleanout Wye or 1/8 bend. Cast iron soil pipe (C1 or C2) and fittings shall be used from Wye to surface. Required clearance around cleanouts shall be maintained.

Cleanout risers outside of a building installed in a surface other than concrete shall terminate in a cleanout to grade. Cleanout to grade shall terminate in a valve box with cover marked "CO-SS". Top of box shall be set flush with finished grade. Cleanout plug shall be 100 mm below grade and shall be located in the box to provide sufficient room for rodding.

Cleanout risers installed in tile and concrete floors, including building aprons and sidewalks, shall terminate in a cleanout through floor.

## INSTALLATION OF MISCELLANEOUS ITEMS

**Water hammer arrestor.**--Water hammer arrestor shall be installed so that they are vertical and accessible for replacement. Water hammer arrestor shall be installed with access door when in walls or there is no access to ceiling crawl spaces. Access door location shall be where shown on the plans or as approved by the Engineer.

**Flushing completed systems.**--All completed systems shall be flushed and blown out.

**Chlorination.**--The Contractor shall flush and chlorinate all domestic water piping and fixtures.

Calcium hypochlorite granules or tablets, if used, shall not be applied in the dry form, but shall first be dissolved into a solution before application.

The Contractor shall take adequate precautions in handling chlorine so as not to endanger workmen or damage materials. All pipes and fittings shall be completely filled with water containing a minimum of 50 ppm available chlorine. Each outlet in the system shall be opened and water run to waste until a strong chlorine test is obtained. The line shall then be closed and the chlorine solution allowed to remain in the system for a minimum of 24 hours so that the line shall contain no less than 25 ppm chlorine throughout. After the retention period, the system shall be drained, flushed and refilled with fresh water.

## FIELD QUALITY CONTROL

**Testing.**--The Contractor shall test piping at completion of roughing in, before backfilling, and at other times as directed by the Engineer.

The system shall be tested as a single unit, or in sections as approved by the Engineer. The Contractor shall furnish necessary materials, test pumps, instruments and labor and notify the Engineer at least 3 working days in advance of testing. After testing, the Contractor shall repair all leaks and retest to determine that leaks have been stopped. Surplus water shall be disposed of after testing as directed by the Engineer.

The Contractor shall take precautions to prevent joints from drawing while pipes and appurtenances are being tested. The Contractor shall repair damage to pipes and appurtenances or to other structures resulting from or caused by tests.

**General tests.**--All piping shall be tested after assembly and prior to backfill, pipe wrapping, connecting fixtures, wrapping joints and covering the pipe. Systems shall show no loss in pressure or visible leaks.

The Contractor shall test systems according to the following schedule for a period of not less than 4 hours:

Test Schedule		
Piping System	Test Pressure	Test Media
Sanitary sewer and vent	3.0 m head	Water
Water	860 kPa	Water

During testing of water systems, valves shall be closed and pipeline filled with water. Provisions shall be made for release of air.

Sanitary sewers shall be cleared of obstructions before testing for leakage. The pipe shall be proved clear of obstructions by pulling an appropriate size inflatable plug through the pipe. The plug shall be moved slowly through the pipe with a tag line. The Contractor shall remove or repair any obstructions or irregularities.

Sanitary sewer pipes beyond 1.5 m perpendicular to the building shall be tested for leakage for a period of not less than 4 hours by filling with water to an elevation of 1.2 m above average invert of sewer or to top of manholes where less than 1.2 m deep. The system shall show no visible leaks. The sewer may be tested in sections with testing water progressively passed down the sewer as feasible. Water shall be released at a rate that will not create water hammer or surge in plugged sections of sewer.

## **12-15.03 MECHANICAL INSULATION**

### **PART 1.- GENERAL**

#### **SUMMARY**

**Scope.--**This work shall consist of furnishing and installing mechanical insulation in accordance with the details shown on the plans and these special provisions.

Piping insulation shall be installed on all domestic hot water piping, above grade, in non-conditioned spaces.

Piping insulation shall be installed on all hydronic supply and return piping, above and below grade unless shown otherwise on the plans.

P-trap, hot water supply pipes and angle valves for lavatories and sinks, except in janitor closets or similar enclosed spaces, shall be insulated.

#### **QUALITY ASSURANCE**

**Codes and standards.--**Mechanical insulation shall conform to California State Energy Commission regulations and, where applicable, shall meet American Society of Testing and Materials (ASTM) standards.

All materials shall bear the label of the Underwriters Laboratory (UL) or other approved testing laboratory indicating that the materials proposed for use conform to the required fire hazard ratings.

Pipe safety insulation shall conform to Section 1504(b) of the CPC.

### **PART 2.- PRODUCTS**

#### **MATERIAL**

**General.--**All pipe insulation and wrapping material, including adhesives and jackets, located within buildings shall be certified to have a composite flame spread rating of not more than 25 and smoke development rating of not more than 450 when tested in accordance with ASTM Designation: E 84.

#### **Domestic water piping insulation**

Piping insulation shall be glass fiber molded pipe insulation with factory applied jacket suitable for service temperatures up to 175°C. Covering jacket shall have pressure sealing lap adhesive joints. Pipe insulation shall have a minimum thermal resistance of  $R-0.5 \text{ K}\cdot\text{m}^2/\text{W}$ . Insulation and jackets shall be Owens-Corning, Fiberglass 25 with ASJ/SSL All Service Jacket; Manville, Micro-Lok 650ML with AP-T All Purpose Jacket; or equal.

#### **Piping insulation cement**

Insulation cement shall be Fenco, All Purpose Cement; Manville, JM375; or equal.

#### **PVC jacket**

PCV jacket shall be rated for a service temperature of 80°C. PVC jacket shall include covers specifically designed to cover pipe fittings.

### **Alternative pipe insulation**

Alternative pipe insulation shall be closed cell, elastomeric material in a flexible tubular form. Insulation shall have a service temperature range between -40°C and 93°C, a minimum vapor transmission rating of 0.29 Perm-m, and a minimum thermal resistance of  $R-0.5 \text{ K}\cdot\text{m}^2/\text{W}$ .

### **Pipe safety insulation**

Pipe safety insulation for P-traps, hot water supply pipes and angle valves shall be molded closed cell vinyl or closed cell foam with exterior vinyl surface. Pipe safety insulation shall be configured to protect against contact. Pipe safety insulation shall be Truebro Inc., Handi Lav-guard; Plumberex Specialty Products, Handy Shield; or equal.

### **Adhesive**

Adhesive shall be non-flammable type: Benjamin Foster Company, No. 85-20 Spark Safe; Goodloe E. Moore Company, Tuff Bond No. 6; Permacel, No. PA-310; 3M, No. 38 Insulation Adhesive; Swift's, No. 7228 brush type or No. 7336 spray type; Chicago Mastic, 17-461; or equal.

### **Studs**

Studs shall be cement-in-place type, pneumatic driven type or percussive welding type, and shall have 25 mm minimum diameter washers.

### **Insulation inserts**

Insulation inserts at pipe hangers supports for pipes NPS 2 or larger shall be calcium silicate, cellular glass, or other acceptable material of the same thickness as the adjacent insulation and not less than 6 kg density.

## **PART 3.- EXECUTION**

### **INSTALLATION**

**General.**--Insulation materials shall be neatly installed with smooth and even surfaces, jackets drawn tight and smoothly cemented down.

Insulation material shall not be installed until all pipes or surfaces to be covered are tested for leaks, cleaned and dried, and foreign materials, such as rust, have been removed.

**Piping insulation.**--Piping insulation shall be in accordance with the following, except that unions, unless integral with valves, and flexible connections shall not be insulated.

1. Where insulation butts against flanges or is discontinued, insulation shall be tapered to pipe to allow for covering jacket to completely seal off end of insulation.

Insulation shall be extended on the valve bodies up to the valve bonnet.

Extend insulation continuous through pipe hangers and pipe sleeves. At hangers where pipe is supported, provide an insulated protection shield.

Insulating cement shall be applied to fittings, valves, and strainers and troweled smooth to thickness of adjacent covering. Strainer cleanout plugs shall remain accessible. Covers fabricated from molded pipe covering may be used in lieu of cement, provided covers are neat and well secured.

2. Jacket flap shall be sealed down with factory applied self-sealing lap. Seams shall be lapped not less than 40 mm. Jacket shall be secured with aluminum bands installed at 300 mm centers.
3. Exposed outdoor insulation shall have an additional 0.40 mm minimum thickness aluminum jacket applied over the completed insulation. The jacket shall have a factory applied moisture barrier and shall be Childers; Smith; or equal.

End joints shall be lapped with aluminum holding traps located directly over the lap. Additional aluminum holding straps shall be placed at 200 mm centers. Jacket at ells and tees shall be mitered, or



premanufactured fitting jackets shall be provided, with additional aluminum holding bands, as required. All joints shall be sealed watertight using silicon type, heat resistant sealant.

4. In-ground insulation shall have an additional PVC jacket applied over the completed insulation and vapor barrier. PVC jacket shall be made watertight with adhesive or sealant as recommended by the PVC jacket manufacturer.

Alternate pipe insulation, where used, shall be installed on hot water piping before connections are made or the insulation may be slit lengthwise, applied to pipe and sealed with adhesive.

**Pipe safety insulation.**--Pipe safety insulation shall be installed in accordance with the manufacturer's recommendations.

**Applying adhesive.**--The adhesive shall be liberally applied over entire interior surfaces of ducts or plenums.

**Stud installation.**--Studs shall be installed as follows:

1. Cement-In-Place Type Studs.--Cement-in-place type studs shall be cemented in place with adhesives manufactured for this purpose and shall be as recommended by the stud manufacturer. Cement-in-place type studs shall be used where concrete walls form part of plenum.
2. Percussive Welding Type Studs.--Percussive welding type studs shall be carefully welded in place with current settings that will not appreciably burn galvanizing on opposite side of the sheet metal.
3. Pneumatic Driven Type Studs.--At locations where pneumatic driven type studs are used, hardened steel backup plates or dollies shall be used under the sheet metal.

## **12-15.04 PLUMBING FIXTURES**

### **PART 1.- GENERAL**

#### **SUMMARY**

**Scope.**--This work shall consist of furnishing and installing plumbing fixtures in accordance with the details shown on the plans and these special provisions.

### **PART 2.- PRODUCTS**

**General.**--Plumbing fixtures shall be white in color and shall meet the following requirements:

#### **Water closet (disabled accessible, floor mounted with flush valve)**

Disabled accessible water closet shall be vitreous china, floor mounted, siphon jet, 410 mm to 440 mm high elongated bowl, 40 mm top spud for exposed battery powered electronic flush valve, with solid plastic open front elongated seat with check hinges. Water closet shall meet or exceed Americans with Disabilities Accessibility Act Guidelines (ADAAG) and ANSI Standards: A117.1 and A112.19.2. Closet and accessories shall be of the following types or equal:

	American Standard	Crane	Kohler
Closet	"Madera 17H EL1.6/FV" 3043.102	"Hymont" 3H-701	"Highcrest" K-4302
Seat	Church Model 9500C 5321.070	Olsonite Model 95C	"Lustra" K-4670-C
Electronic Flush valve	6.0/4.2 Liter per flush exposed, diaphragm type, chrome plated, battery powered/ infrared "hands free" sensor and manual flushing buttons with integral control stop, adjustable tail piece and vacuum breaker suitable for use with 40 mm spud water closets. ZURN Model No. ZTS6200EV SLOAN, Model No. WETS-2050.1201-1.28 SOLIS. KOHLER, Model No. K-10956		

#### Lavatory (wall-mounted)

Lavatory shall be vitreous china, with back, integral perforated grid drain, drilled for 102 mm centers, size 508 mm x 457 mm, with single extra long lever mixing faucet and chair carrier with concealed arms. Lavatory shall be equipped with temperature controls to limit the hot water supply to 43°C. Lavatory shall be equipped with a flow limiting device that limits the flow rate of hot water to no more than 2 liters per minute. Lavatory and accessories shall be of the following types or equal:

	Eljer	Crane	Kohler
Lavatory	"Blair" 051-1308	"Norwich" 1165V	"Greenwich" K-2032
Drain	--	C-1065-G or Moen 52659	K-7715
Supplies	Brass Craft FR1711C	C-1151 or Moen 52664	K-7605
Electronic Faucet	1.9 Liter per minute solar or battery powered electronic faucet shall be a total self contain unit with the electronic component and battery accessible from above the sink. The unit shall be DC power source, all brass or die-cast construction and ADA compliant.		
	GROHE Europlus E "Touch-Free" 36- 227-000	SLOAN SOLIS, EAF-275-ISM-CP	KOHLER, K-10950
Trap	32 mm chromium plated brass exposed bent tube adjustable 1.37 mm (17-gage) minimum thickness.		
Carrier	Concealed wall mounted carrier with leveling screws and locking devices; Zurn, J.R. Smith, Josam, Wade, Jonespec, or equal.		

#### Lavatory (counter mounted)

Lavatory shall be self-rimming vitreous china, integral perforated grid drain, drilled for 102 mm centers, nominal bowl size 254 mm x 457 mm, with single extra long lever mixing faucet. Lavatory shall be equipped with temperature controls to limit the hot water supply to 43°C. Lavatory shall be equipped with a flow limiting device that limits the flow rate of hot water to no more than 2 liters per minute. Lavatory and accessories shall be of the following types or equal:

	American Standard	Eljer	Kohler
Lavatory	"	"Bordeaux" 212-1500	"Tocata" K-3349
Drain	2411.015	803-0580	K-8801
Supplies	Brass Craft FR1711C		K-8803
Electronic Faucet	1.9 Liter per minute solar or battery powered electronic faucet shall be a total self contain unit with the electronic component and battery accessible from above the sink. The unit shall be DC power source, all brass or die-cast construction and ADA compliant.		
	GROHE Europlus E "Touch-Free" 36- 227-000	SLOAN SOLIS, EAF-275-ISM-CP	KOHLER, K-10950
Trap	32 mm chromium plated brass exposed bent tube adjustable 1.37 mm (17-gage) minimum thickness.		

#### **Water heater (electric)**

Water heater shall be the tankless type flow-activated electric, suitable for 140 to 310 kPa water pressure, and shall provide a 31°C water temperature rise at 0.03 liters per second water flow. Heater shall be wall mounted, equipped with metal housing, and have over-temperature protection. Capacity and electrical service shall be as shown on the plans.

### **PART 3.- EXECUTION**

#### **INSTALLATION**

**General.**--All finish for exposed metal on any fixture, including wall flanges, bolts, nuts and washer, shall be polished chrome plated.

Fixtures shall be sealed to wall or floor with silicone caulk bead.

All exposed metal surfaces on fixture supports shall be enameled to harmonize with fixtures.

Wall mounted fixtures shall be installed on concealed chair carriers designed to support weight of fixture from the floor, made for the specific fixture to be supported and for the particular installation conditions.

All fixtures, including showers, shall be provided with accessible metal stop valves.

Hot water supply, trap and tailpiece on lavatories shall be wrapped with insulating material.

Flush valves for fixtures designated on the plans as disabled accessible shall be installed so that the valve handle is on the widest side of the toilet space.

#### **FIXTURE MOUNTING HEIGHTS**

**General.**--Unless otherwise noted, fixtures shall be mounted at the heights shown on the plans.

#### **FIELD QUALITY CONTROL**

**Testing.**--The Contractor shall test piping in accordance with the requirements specified elsewhere in these special provisions.

All installed fixtures shall be tested for proper operation after all plumbing work has been completed.

### **12-15.05 HEATING, VENTILATING AND AIR CONDITIONING EQUIPMENT AND SYSTEMS**

#### **PART 1.- GENERAL**

**Scope.**--This work shall consist of furnishing, installing and testing heating, ventilating and air conditioning (HVAC) equipment in accordance with the details shown on the plans and these special provisions.

The performance rating and electric service of the HVAC equipment shall be as shown on the plans.

**Temperature controls.**—Thermostats, microprocessor controller relays, timer switches, and other sensor type control devices required for this work shall be furnished and installed by the supplier of the heating, ventilating and air conditioning equipment. All temperature control wiring shall be furnished and installed in accordance with the requirements specified in Section 12-16, "Electrical," of these special provisions.

**Codes and standards.**--Equipment and systems shall conform to California State Energy Commission Regulations and, where applicable, shall be American Refrigeration Institute (ARI), American Gas Association (AGA), Sheet Metal and Air Conditioning Contractors National Association, Inc. (SMACNA), California Mechanical Code, California Energy Code and Air Movement and Control Association (AMCA) approved for performance ratings and application shown on the plans.

Any appliance for which there is a California standard established in the Appliance Efficiency Standards may be installed only if the manufacturer has certified to the Commission, as specified in those regulations, that the appliance complies with the applicable standards for that appliance. Space conditioning equipment may be installed only if the manufacturer has certified that the equipment meets or exceeds all applicable efficiency requirements listed in the Energy Efficiency Standards.

## **PART 2.- PRODUCTS**

### **HEATING AND COOLING UNITS**

#### **Electric wall heater**

Electric wall heater shall be forced air, recessed type, and shall be equipped with a grille and integral thermostat.

#### **Heat pump (ductless)**

Heat pump shall be variable capacity split type system consist of an outdoor condenser unit with an indoor fan/coil unit. The condenser unit shall consist of a rotary or scroll type compressor, condensing coil, fan and all controls, tubing and appurtenances required for a complete operating system. The indoor fan coil units shall consist of an evaporating coil, expansion control device, centrifugal fan, high efficiency filter auxiliary electric heat strips microprocess remote temperature controller and provision for fresh air intake. In addition, the indoor unit shall come with a plug or local disconnect. The system shall provide heating or cooling as required by the remote temperature controller. Units shall be Sanyo, Mitsubishi Electric, Toshiba, or equal.

### **FANS AND VENTILATORS**

#### **Exhaust fan (wall mounted)**

Exhaust fan shall be wall mounted, and shall be equipped with grille, metal housing, backdraft damper, centrifugal fan wheel and bird screen. Fan motor and fan assembly shall be isolated from base with rubber vibration isolators. Fan shall be completely weatherproof and shall have a disconnect means under the hood and fan motor shall have integral thermal overload protection. Wall exhaust fan shall be Panasonic, Jenn-Air; Carnes; EWDA; Penn; or equal.

### **AUXILIARY HVAC COMPONENTS**

#### **Refrigerant and condensate drain piping**

Condensate drain piping shall be rigid, Type L copper tubing with brazed solder fittings.

## **PART 3.- EXECUTION**

### **INSTALLATION**

**Condensate drains.**--Air conditioning units and heat pumps shall be provided with condensate drain trap and piping. Outdoor piping shall extend to the nearest roof drain, gutter or as shown on the plans. Air gap shall be installed where required by code. Interior condensate drain piping shall be insulated with foam insulation.

### **FIELD QUALITY CONTROL**

**Pre-test requirements.**--Before starting or operating systems, equipment shall be cleaned and checked for proper installation, lubrication and servicing.

In each system, at least one air path, from fan to final outlet, shall have all balance dampers open. The final air quantities shall be achieved by adjusting the volume dampers or the fan RPM.

Final adjustments and balancing of the systems shall be performed in such a manner that the systems will operate as specified and as shown on the plans.

The Contractor shall replace or revise any equipment, systems or work found deficient during tests.

All automatic operating devices which are pertinent to the adjustment of the aforementioned air systems shall be set and adjusted to deliver the required quantities of air and at temperatures specified by the Engineer. All control work shall be done in collaboration with the control manufacturer's representative.

**Project completion tests.**--The Engineer shall be notified at least 3 working days in advance of starting project completion tests.

Upon completion of mechanical work and pre-test requirements, or at such time prior to completion as determined by the Engineer, the Contractor shall operate and test installed mechanical systems for at least 3 consecutive 8-hour days to demonstrate satisfactory overall operation.

## **SECTION 12-16. ELECTRICAL**

### **12-16.01 ELECTRICAL WORK**

#### **PART 1.- GENERAL**

##### **SUMMARY**

**Scope.**--This work shall consist of performing electrical work in accordance with the details shown on the plans and these special provisions.

Electrical work shall include furnishing all labor, materials, equipment and services required to construct and install the complete electrical system shown on the plans and the work of installing electrical connections for the thermostats, motors, and controls specified elsewhere in these special provisions.

System layouts are generally diagrammatic and location of equipment is approximate. Exact routing of conduits and other facilities and location of equipment is to be governed by structural conditions and other obstructions, and shall be coordinated with the work of other trades. Equipment requiring maintenance and inspection shall be located where it is readily accessible for the performance of such maintenance and inspection.

**Related work.**--Earthwork, foundations, sheet metal, painting, mechanical and such other work incidental to and necessary for the proper installation and operation of the electrical work shall be done in accordance with the requirements specified for similar work elsewhere in these special provisions.

##### **CLOSEOUT SUBMITTALS**

**Operation and Maintenance Manuals.**--Prior to the completion of the contract, 3 identified copies of the operation and maintenance instructions with parts lists for the equipment specified herein shall be delivered to the Engineer at the jobsite. The instructions and parts lists shall be in a bound manual form and shall be complete and adequate for the equipment installed. Inadequate or incomplete material will be returned. The Contractor shall resubmit adequate and complete manuals at no expense to the State.

Manuals shall be submitted for the following equipment:

PTZ CCTV Camera (including enclosure)

## **QUALITY ASSURANCE**

**Codes and Standards.**--All work performed and materials installed shall be in accordance with the CEC and the California Code of Regulations, Title 8, Chapter 4, "Electrical Safety Orders."

**Warranties and Guarantees.**--Manufacturer's warranties and guarantees for materials or equipment used in the work shall be delivered to the Engineer at the jobsite prior to acceptance of the contract.

## **TESTING**

After the electrical system installation work has been completed, the electrical system shall be tested in the presence of the Engineer to demonstrate that the electrical system functions properly. The Contractor shall make necessary repairs, replacements, adjustments and retests at his expense.

## **12-16.02 BASIC MATERIALS AND METHODS**

### **PART 1.- GENERAL**

#### **SUMMARY**

**Scope.**--This work shall consist of furnishing and installing conduits, conductors, fittings, and wiring devices in accordance with the details shown on the plans and these special provisions.

Conduits, conductors, fittings, and wiring devices shall include those accessories and appurtenances, not mentioned, that are required for the proper installation and operation of the electrical system.

**Related Work.**--Roof penetrations shall be flashed and sealed watertight conforming to the requirements specified under "Sheet Metal Flashing" in Section 12-7, "Thermal and Moisture Protection," of these special provisions.

Where conduits pass through fire rated walls, floor or ceiling assemblies, the penetrations shall be protected in accordance with the requirements specified under "Through-Penetration Firestopping" in Section 12-7, "Thermal and Moisture Protection," of these special provisions.

#### **SUBMITTALS**

**Product Data.**--A list of materials and equipment to be installed and the manufacturer's descriptive data shall be submitted for approval. Any other data as requested by the Engineer shall also be submitted for approval.

Manufacturer's descriptive data shall include complete description, performance data and installation instructions for the materials and equipment specified herein. Control and wiring diagrams, rough-in dimensions for recessed junction and pull boxes, and component layout shall be included where applicable. All control and power conductors on the shop drawings shall be identified with wire numbers.

### **PART 2.- PRODUCTS**

#### **CONDUITS AND FITTINGS**

##### **Rigid Steel Conduit and Fittings**

1. Rigid steel conduit shall be threaded, full weight rigid steel, hot-dip galvanized inside and outside with steel or malleable iron fittings. Fittings shall be threaded unless otherwise specified or shown on the plans.
2. Split or three-piece couplings shall be electroplated, malleable cast iron couplings.
3. Insulated grounding bushings shall be threaded malleable cast iron body with plastic insulated throat and steel, lay-in ground lug with compression screw.
4. Insulated metallic bushings shall be threaded malleable cast iron body with plastic insulated throat.

### **Electrical Metallic Tubing (EMT) and Fittings**

1. Electrical metallic tubing shall be formed of cold rolled strip steel, electrical resistance welded continuously along the longitudinal seam with zinc coating outside and enamel or lacquer coating inside.
2. Couplings shall be electroplated, rain and concrete tight, gland compression type, steel body couplings with malleable iron nuts.
3. Connectors shall be electroplated, rain and concrete tight, gland compression type, steel body connectors with male hub, malleable iron nut and insulated plastic throat.

### **Flexible Metallic Conduit and Fittings**

1. Flexible metallic conduit shall be fabricated in continuous lengths from galvanized steel strip, spirally wound and formed to provide an interlocking design.
2. Fittings shall be electroplated screw-in type with malleable cast iron body and threaded male hub with insulated throat.

### **Liquid Tight Flexible Metallic Conduit and Fittings**

1. Liquid tight flexible metallic conduit shall be fabricated in continuous length from galvanized sheet steel, spirally wound and formed to provide an interlocking design with an extruded polyvinyl chloride cover.
2. Fittings shall be electroplated, malleable cast iron body, with cap nut, grounding ferrule, and connector body with insulated throat.

## **CABLES AND CONDUCTORS**

### **Cat 6 Cables**

Cat 6 cables shall be category 6e rated 500 MHz, 4 pair, 23 AWG, unshielded twisted pair (UTP), low loss, CMP Rated (plenum rated), extended frequency data cable and shall conform to TIA/EIA 568A Commercial Telecommunications Buildings Standards, Horizontal Cable Section and be part of UL Law Certifications and Follow-up program. Pairs coloring shall be according to EIA/TIA 568 standards.

### **Cat 5e Cables**

Cat 5e cables shall be category 5e rated 100 MHz, 4 pair, 24 AWG, unshielded twisted pair (UTP), low loss, CMP Rated (plenum rated), data cable and shall conform to TIA/EIA 568A Commercial Telecommunications Buildings Standards, Horizontal Cable Section and be part of UL Law Certifications and Follow-up program. Pairs coloring shall be according to EIA/TIA 568 standards.

### **Conductors**

1. Conductors shall be stranded copper wire.
2. Conductor insulation types unless otherwise shown or specified, shall be as follows:
  - 2.1. Conductors across hinges of control panel enclosures shall be Type MTW.
  - 2.2. Conductors shall be type XHHW-2 in wet, underground, and outdoor locations.
  - 2.3. Conductors shall be type THHN in dry locations.

### **Wire Connections and Devices**

3. Wire connections and devices shall be pressure or compression type, except that connectors for No. 10 AWG and smaller conductors in dry locations may be preinsulated spring-pressure type.

## **ELECTRICAL BOXES**

### **Outlet, Device and Junction Boxes**

1. Unless otherwise shown or specified, boxes shall be galvanized steel boxes with knock-outs and shall be the size and configuration best suited to the application indicated on the plans. Minimum size of outlet, receptacle, switch or junction boxes shall be 100 mm square by 40 mm deep, except that switch boxes for the installation of single switches and outlet boxes for flush-mounted light fixtures shall be 50 mm by 75 mm by 40 mm deep.
2. Multiple switches shall be installed in standard gang boxes, unless otherwise specified or shown on the plans.

3. Cast metal boxes shall be cast iron boxes with threaded hubs and shall be of the size and configuration best suited to the application shown on the plans.
4. Flush-mounted boxes shall have stainless steel covers, one mm thick. Cover screws shall be metal with finish to match cover finish.
5. Unless otherwise shown or specified, surface-mounted boxes shall have galvanized steel covers with metal screws.
6. Weatherproof junction boxes shall have cast metal covers with gaskets.
7. Weatherproof switch and receptacle boxes shall have gasketed covers with gasketed hinged flaps to cover switches and receptacles.

#### **Underground Pull Boxes**

1. Pull boxes shall be high density reinforced concrete box with ultraviolet inhibitor polyethylene etched face anchored in concrete and fiberglass cover with hold down bolts. The polyethylene and fiberglass material shall be fire resistant and show no appreciable change in physical properties with exposure to the weather. No. 3 1/2 pull box shall be Brooks Products, No. 3 1/2; Christy Concrete Products, N9; or equal. No. 5 pull box shall be Brooks Products No. 5; Christy Concrete Products, N30; or equal.
2. Traffic rated pull boxes shall be high density reinforced concrete box with steel cover with hold down bolts and bonding strap. Pull box and cover shall be designed for H20 loading. No. 3 1/2 pull box shall have inside dimensions of 270 mm by 440 mm and No. 5 pull box shall have inside dimensions of 335 mm by 610 mm.

### **RECEPTACLES AND SWITCHES**

#### **Ground Fault Circuit Interrupter Receptacles, (GFCI)**

Ground fault circuit interrupter receptacles shall be NEMA Type 5-20R, feed-through type, ivory color, 3-wire, 20-ampere, 125-volt AC, grounding type, specification grade, duplex receptacle with ground fault interruption. Receptacle shall detect and trip at current leakage of 5 milliamperes and shall have front mounted test and reset buttons.

#### **Duplex Receptacles**

Duplex receptacles shall be NEMA Type 5-20R, 3-wire, 20-ampere, 125-volt AC, safety grounding, ivory color, specification grade receptacle suitable for wiring with stranded conductors.

#### **Snap Switches**

Snap switches shall be 20-ampere, 120/277-volt AC, quiet type, specification grade, ivory color switch with silver cadmium alloy contacts. Switch shall be suitable for wiring with stranded conductors.

#### **Timer Switches, Ts**

Timer switches shall be 20-ampere, 120-volt AC, 60 minute spring wound mechanical timer switch without a "hold" feature.

#### **Dimming Switch**

Dimming switch shall be a complete solid-state dimmer switch. Switch shall provide full to 2 percent light output by means of a linear slide adjustment. Dimming switches using knob type control shall not be acceptable. Dimming switch shall be compatible with the dimming ballast provided for the light fixtures and shall be of adequate capacity to control all the loads as shown on the plans. Dimming switch shall incorporate on/off switch and an integral radio frequency filter. Dimming switch shall be UL listed.

### **MISCELLANEOUS MATERIALS**

#### **Warning Tape**

Warning tape shall be 100 mm wide and contain the printed warning "CAUTION ELECTRICAL CONDUIT" in bold 19 mm black letters at 760 mm intervals on bright orange or yellow background. The printed warning shall be non-erasable when submerged under water and resistant to insects, acids, alkali, and other corrosive elements in the soil. The tape shall have a tensile strength of not less than 70 kg per 100 mm wide strip and shall have a minimum elongation of 700 percent before breaking.



### **Pull Ropes**

Pull ropes shall be nylon or polypropylene with a minimum tensile strength of 225 kg.

### **Watertight Conduit Plugs**

Watertight conduit plugs shall be a hollow or solid stem expansion plugs complete with inner and outer white polypropylene compression plates and red thermoplastic rubber seal. Seal material shall be non-stick type rubber resistant to oils, salt, and alkaline substances normally available at the construction sites.

### **Anchorage Devices**

Anchorage devices shall be corrosion resistant, toggle bolts, wood screws, bolts, machine screws, studs, expansion shields, and expansion anchors and inserts.

### **Electrical Supporting Devices**

1. Electrical supporting devices shall be one hole conduit clamps with clamp backs, hot-dipped galvanized, malleable cast iron.
2. Construction channel shall be 41 mm x 41 mm, 2.66 mm (12-gage) galvanized steel channel with 13 mm diameter bolt holes, 40 mm on center in the base of the channel.

### **Ground Rod(s)**

Ground rod(s) shall be a 19 mm (minimum) galvanized or copper clad steel rod, 3 meters long.

### **Telephone Outlet Boxes**

#### **CAT 6 Terminal Jack**

Cat 6 termination jack shall be modular termination device for Category 6 cable and shall snap into CAT 6 face plates and/or CAT 6 termination boxes. Cat 6 termination jack shall allow punch down termination of 4 pairs of 22-24 AWG, UTP cables on the back of the Jack and a male RJ-45 connector on the front. Cat 6 termination jack shall be UL approved, fit 568A or 568B applications and meet or exceed TIA/EIA CAT 6 specification to support 1000 Base-T & Gigabit Ethernet system applications.

#### **CAT 5e Terminal Jack**

Cat 5e termination jack shall be modular termination device for Category 5 cable and shall snap into CAT 5 face plates and/or CAT 5 termination boxes. Shall be similar to CAT 6 Terminal Jack except for terminating CAT 5e cable.

#### **CAT 6 Face Plate**

CAT 6 face plates shall be constructed to secure 1 thru 4 CAT 6 termination jacks as required for the termination location. Faceplates shall mount to junction boxes. Faceplate shall be Ivory or White in color to match surrounding wall paint.

#### **CAT 6 Termination Boxes**

CAT 6 termination boxes shall have space for CAT 6 termination jacks to lock into. Termination boxes shall fit 1, 2 or 4 jacks (as required for the location) so they are accessible from the exterior. Termination boxes shall have a means to be secure to the wall (or other surface) in a permanent manner.

#### **Telephone Terminal Block, Tel Block**

Telephone terminal block shall be a 25 pair building entrance terminal board with 110 connector input and output, equipped with internal fuse link, which accommodates standard 5 pin protection module, has external ground connector, and is designed to meet or exceed UL 497. The telephone block shall come with 5 pin protector modules, have an external grounding connector and be suitable for wall mounting. Telephone terminal block shall be Emerson Network Power, Catalog No. BEPNCT25T; Circa Telecom, Catalog No. 1880ENA1/NSC-25; Porta Systems, Catalog No. 1525 25 Pair Protector block; or equal.

## **PART 3.- EXECUTION**

### **INSTALLATION**

**Conduit, General.--**Rigid steel conduit shall be used unless otherwise shown on the plans or specified in these special provisions.

Electrical metallic tubing may be used in furred spaces and for exposed work indoors above the switch height.

Unless otherwise specified or shown on the plans, flexible metal conduit shall be used to connect suspended lighting fixtures, motors, HVAC equipment, and other equipment subject to vibration in dry locations.

Unless otherwise specified or shown on the plans, liquid-tight flexible metal conduit shall be used to connect motors, HVAC equipment, and other equipment subject to vibration in wet locations.

**Conduit Installation.--**Conduit trade sizes are shown on the plans. No deviation from the conduit size shown on the plans will be permitted without written permission from the Engineer.

Conduit shall be concealed unless otherwise shown on the plans.

Conduits shall be tightly covered and well protected during construction using metallic bushings and bushing "pennies" to seal open ends.

A pull rope shall be installed in all empty conduits. At least one meter of pull rope shall be doubled back into the conduit at each termination.

Locations of conduit runs shall be planned in advance of the installation and coordinated with the ductwork, plumbing, ceiling and wall construction in the same areas and shall not unnecessarily cross other conduits or pipe, nor prevent removal of ceiling tiles or panels, nor block access to mechanical or electrical equipment.

Where practical, conduits shall be installed in groups in parallel, vertical or horizontal runs and at elevations that avoid unnecessary offsets.

Exposed conduit shall be installed parallel and at right angles to the building lines.

Conduits shall not be placed closer than 300 mm from a parallel hot water or steam pipe or 75 mm from such lines crossing perpendicular to the runs.

All raceway systems shall be secured to the building structures using specified fasteners, clamps and hangers.

All metal conduits, metal conduit risers, and metal conduit elbows in contact with soil or concrete shall be wrapped with a double layer of 0.5 mm thick pipe wrapping tape. Each individual layer shall be overlapped a minimum of 50 percent.

Single conduit runs shall be supported by using one hole pipe clamps. Where run horizontally on walls in damp or wet locations, conduit shall be installed with "clamp backs" to space conduit off the surface.

Multiple conduit runs shall be supported with construction channel secured to the building structure. Conduits shall be fastened to construction channel with channel compatible pipe clamps.

Raceways of different types shall be joined using approved couplings or transition fittings.

Expansion couplings shall be installed where conduit crosses a building separation or expansion joint.

All floor and wall penetrations shall be sealed water-tight.

Existing underground conduit to be incorporated into a new system shall be cleaned with a mandrel or cylindrical wire brush and blown out with compressed air.

**Conduit Terminations.--**Rigid steel conduits shall be securely fastened to cabinets, boxes and gutters using 2 locknuts and specified insulating metallic bushing. Electrical metallic tubing shall be securely fastened to cabinets, boxes and gutters using specified connectors. Conduit terminations at exposed weatherproof enclosures and cast outlet boxes shall be made watertight using specified hubs.

Grounding bushings with bonding jumpers shall be installed on all type of conduits terminating at concentric knockouts and on all conduits containing service conductors, grounding electrode conductor, and conductors feeding separate buildings.

All future conduits terminated in underground pull boxes or exposed indoor and outdoor shall be provided with watertight conduit plugs.

**Warning Tape.--**Warning tape shall be placed over each conduit in a trench. Each warning tape shall be centered over the conduit and shall be placed over the 150 mm layer of sand covering the conduit as described elsewhere in these special provisions.

**Conductor and Cable Installation.--**Conductors shall not be installed in conduit until all work of any nature that may cause injury is completed. Care shall be taken in pulling conductors that insulation is not damaged. An approved non-petroleum base and insulating type pulling compound shall be used as needed.

All cables shall be installed and tested in accordance with manufacturer's recommendations.

Splices and joints shall be insulated with insulation equivalent to that of the conductor.

Provide 155 mm of slack at each outlet and device connection. If the outlet or device is not at the end of a run of wire, connection shall be made with correctly colored pigtails tapped to the runs with splices as specified herein.

Branch circuit conductors in panelboards and load centers shall be neatly trained along a path from the breaker terminals to their exit point. The conductors shall have ample length to transverse the path without strain, but shall not be so long as to require coiling, doubling back, or cramming. The path shall transverse the panelboard gutter spaces without entering a gutter containing service conductors and, unless otherwise shown on the plans, without entering the gutter space of any panelboard feeder.

All pressure type connectors and lugs shall be retightened after the initial set.

Splices in underground pull boxes and similar locations shall be made watertight.

Junction boxes in furred or accessible ceiling spaces shall be identified with felt-tip pen denoting the circuits contained in the box.

**Conductor Identification.**--The neutral and equipment grounding conductors shall be identified as follows:

Neutral conductor shall have a white or natural gray insulation except that conductors No. 4 and larger may be identified by distinctive white marker such as paint or white tape at each termination.

Equipment grounding conductor shall be bare or insulated. If insulated, equipment grounding conductors shall have green or green with one or more yellow stripes insulation over its entire length except that conductors No. 4 and larger may be permanently identified by distinctive green markers such as paint or green tape over its entire exposed insulation.

Ungrounded feeder and branch circuit conductors shall be color coded by continuously colored insulation, except conductors No. 6 AWG or larger may be color coded by colored tape at each connection and where accessible. Ungrounded conductor color coding shall be as follows:

SYSTEM	COLOR CODE
120/208V-Three phase	Black, red, blue

Once an insulated circuit conductor, including grounded and ungrounded conductors, is identified with a specific color code, that color code shall be used for the entire length of the circuit.

Where more than one branch circuit enters or leaves a conduit, panel, gutter, or junction box, each conductor shall be identified by its panelboard and circuit number. All control conductors including control conductors of manufacturer supplied and field wired control devices shall be identified at each termination with the wire numbers shown on the plans, approved working drawings, and as directed by the Engineer where deemed necessary. Identification shall be made with one of the following:

1. Adhesive backed paper or cloth wrap-around markers with clear, heat shrinkable tubing sealed over either type of marker.
2. Pre-printed, white, heat-shrinkable tubing.

Each terminal block shall have a molded marking strip attached with screws. The identifying numbers of the terminating conductors, as shown on the plans or on the submittal drawings, shall be engraved in the marking strip.

**Outlet, Device and Junction Box Installation.**--Where exposed threaded steel conduits are connected to an outlet, device, or junction box below switch height, the box shall be a cast metal box. Unless otherwise shown on the plans or specified in these special provisions, all other boxes shall be sheet steel boxes. Weatherproof outlet, device and junction boxes shall have cast metal covers with gaskets. Unless otherwise shown on the plans or specified in these special provisions, all other boxes shall have standard galvanized covers.

All boxes shall finish flush with building walls, ceiling and floors except where exposed work is called for.

Raised device covers (plaster rings) shall be installed on all boxes concealed in concrete, masonry or stud walls.

No unused openings shall be left in any box. Knockout seals shall be installed as required to close openings.

Outlet, device, and junction boxes shall be installed at the locations and elevations shown on the plans or specified herein. Adjustments to locations may be made as required by structural conditions and to suit coordination requirements of other trades.

Boxes in stud walls and partitions shall not be mounted back to back. Through-wall boxes shall not be used.

Boxes installed in metal stud walls shall be equipped with brackets designed for attaching directly to the studs or shall be mounted on heavy gauge galvanized steel, snap-in box supports.

Fixture outlet boxes installed in suspended ceilings of gypsum board or lath and plaster construction shall be mounted on 1.52 mm (16-gage) metal channel bars attached to main ceiling runners.

Fixture outlet boxes for pendant-mounted fixtures installed in suspended ceilings supporting acoustical tiles or panels shall be supported directly from the structures above.

**Underground Pull Box Installation.**--Electrical pull box covers or lids shall be marked "ELECTRICAL." Telephone service pull box covers or lids shall have plain, unmarked covers.

The bottom of pull boxes shall be bedded in 155 mm of clean, crushed rock or gravel and shall be grouted with 40 mm thick grout prior to installation of conductors. Grout shall be sloped to a 25 mm PVC pipe drain hole. Conduit shall be sealed in place with grout.

Top of pull boxes shall be flush with surrounding grade or top of curb. In unpaved areas where pull box is not immediately adjacent to and protected by a concrete foundation, pole or other protective construction, the top of pull box shall be set at plus 30 mm above surrounding grade. Pull boxes shown on the plans in the vicinity of curbs shall be placed adjacent to the back of curb. Pull boxes shown on the plans adjacent to lighting standards shall be placed on the side of foundation facing away from traffic.

**Ground Rod(s) Installation.**--The ground rod(s) shall be driven vertically until the top is 155 mm above the surrounding surface. When vertical penetration of the ground rod cannot be obtained, an equivalent horizontal grounding system, approved by the Engineer, shall be installed.

**Anchorages.**--Hangers, brackets, conduit straps, supports, and electrical equipment shall be rigidly and securely fastened to surfaces by means of toggle bolts on hollow masonry; expansion shields and machine screws, or expansion anchors and studs or standard preset inserts on concrete or solid masonry; machine screws or bolts on metal surfaces; and wood or lag screws on wood construction.

Anchorage devices shall be installed in accordance with the anchorage manufacturer's recommendations.

**Mounting Heights.**--Electrical system components shall be mounted at the following mounting heights, unless otherwise shown on the plans. The mounting height dimensions shall be measured above the finished floor to the bottom of the device or component.

Thermostats	1.1 m maximum
Wall switches	1.0 m maximum
Convenience outlets	510 mm minimum

## 12-16.03 ELECTRICAL EQUIPMENT

### PART 1.- GENERAL

#### SUMMARY

**Scope.**--This work shall consist of furnishing and installing panelboards, CCTV camera, switches, and miscellaneous materials in accordance with the details shown on the plans and these special provisions.

**Related work.**--Anchorage devices shall be as specified under "Basic Materials and Methods" elsewhere in this Section 12-16.

#### SUBMITTALS

**Product data.**--A list of materials and equipment to be installed and the manufacturer's descriptive data shall be submitted for approval.. Any other data as requested by the Engineer shall also be submitted for approval.

Manufacturer's descriptive data shall include complete description, performance data and installation instructions for the materials and equipment specified herein. Control and wiring diagrams, rough-in dimensions, and component layout shall be included where applicable. All control and power conductors on the shop drawings shall be identified with wire numbers.

### PART 2.- PRODUCTS

#### PANELBOARDS

### **Loadcenter G**

Loadcenter G shall be indoor type, surface-mounted, factory assembled, 3-phase, 4-wire, 120/208-volt, AC loadcenter at most 380 mm wide by 610 mm high with \_minimum 125-ampere main lugs, and backfeed 60 ampere, 3 pole circuit breaker, insulated groundable neutral, hinged door and molded case branch circuit breakers as shown on the plans. Loadcenter shall be Cutler Hammer , Type CH; Siemens , Type EQIII; or equal.

### **FO Patch Panel**

FO Patch Panel shall be SC/LC/FC/ST adapter compatible, 24 port rack mountable patch panel with pull out drawer suitable for mounting in a 19 inch wide rack. Patch panel shall have a minimum of 40 mm bend radius on FO cables. The panel shall come with all associated hardware for termination of FO cables.

### **Communication Rack**

Communication rack shall be 14 U height, have 4 steel rack rails, floor mounting plates with holes to allow a variable rack depth, and black powder coat finish. The rack shall come with hardware as required to mount to the concrete floor and bracket hardware to secure 3 rack mounted devices.

### **Gates Control Panel**

Gates control panel shall consist of selector switches and nameplates on the hinged door of a NEMA-12 console enclosure.

### **Signal Lights Control Station**

Signal lights control station shall consist of selector switches and nameplates on the hinged door of a NEMA-12 console enclosure.

### **Selector Switches, SS1 thru SS12**

Selector switches shall be rotary action, double pole, 2-position, 10-ampere, 120-volt switch. Switch contacts shall have an inductive pilot duty rating of 60 amperes (make), 6 amperes (break) and 10 amperes (continuous) at 120 volts and 35 percent power factor. Selector switches shall have legend plate marked ON-OFF.

### **Control Disconnect Switch, CD**

Control disconnect switch shall be the same as selector switches above.

### **Nameplates**

Nameplates shall be the same as indicated elsewhere in these General Conditions. Inscriptions shall be as indicated on the plans.

### **Gates Control Panel Enclosure**

Gates control panel enclosure shall be a single door NEMA Type 12 console, with 305 mm high x 406 mm wide hinged top (sloped at 30 degrees above horizontal) with captivated cover screws x 231 mm deep enclosure, conforming to the joint industry conference standards.

### **Signal Lights Control Station Enclosure**

Signal lights control station enclosure shall be the same as the gates control panel enclosure.

### **Pilot Light, PL1 thru PL4**

Pilot lights shall be panel mounted, heavy duty, oil tight indicating light with 120-volt, AC, LED lamp with red or green domed cap as indicated on the plans.

## **FABRICATION**

### **Component Mounting**

The following electrical components shall be mounted on hinged door of the signal lights control station:

Selector switches, SS1 thru SS3 (do not install legend plates)

Disconnect switch, DS  
Pilot lights, PL1 thru PL4  
Nameplates

The following electrical components shall be mounted on hinged door of the gates control panel:

Selector switches, SS4 thru SS12  
Nameplates

## **CCTV CAMERA EQUIPMENT**

### **PTZ CCTV Camera**

Shall be a high performance, high speed, outdoor pan tilt zoom, integrated dome camera system with 6.35 mm (or 8.5 mm) progressive scan color CCTV camera, 36X optical zoom (lens length 4.7-84 mm, 3.4-122 mm, 4.1-74 mm, or equivalent) and 12X digital zoom. The camera shall be autofocus, high resolution (minimum 752 horizontal x 494 vertical effective pixels), low light color camera. The camera shall be day and night operation and operate down to 0.65 lux (color) and 0.08 lux (black and white). The camera shall have image flip capacity to correct image when installed upside down (below the soffit). The pan movement shall 360 degrees continuous rotation at a speed from 0.1 to 80 degrees per second with manual control. Tilt shall have a range from 0 to -90 degrees at a speed from 0.1 to 40 degrees per second with manual control. Dome system shall have configurable limit stops for auto/random/frame scan modes. Dome camera system shall have a minimum of 20 preset positions. Dome camera system shall have motion detection, noise reduction. Dome shall be NEMA 4X and IP66 rated, weatherproof aluminum (grey color) with acrylic smoked color bubble, and have integral sun shield, fan and heater. Dome shall come with mounting attachment and associated hardware as required for mounting to the canopy (semi-recessed in soffit or with mounting arm to vertical surface) and on top of the metal pole. Dome and camera shall come with the capability of video transmission through signal over passive UTP circuit (twisted pair conductors and RJ-45 connector). The camera shall have addressable IP protocol. Communications shall be TCP/IP protocol and have compression format MPEG/JPEG/H.264. Input voltage shall be nominal 24 V(ac) and maximum power draw of 80 watts. Dome and camera shall be Panasonic, Catalog No WV-SW395; Bosch, Catalog No VG4-524-ETE; Sony, Catalog No SNCRS86N; with accessories as required, or equal.

### **CCTV Camera Power Supply**

The CCTV camera power supply shall be outdoor rated, 120 volt AC input and 24 volt AC output. It shall meet NEMA 4X/IP66 Standards for weatherproof enclosures and be UL listed. It shall have at least 5 fused outputs capable of handling 20 amps at 24 volt AC (480 VA) total. Outputs shall be protected by 4 ampere fuses. Power supply shall be made by Bosch, Pelco; Cohu; or equal.

## **SWITCHES**

### **Heat Pump Disconnect Switch**

Heat Pump Disconnect switch shall be 2-pole, 240-volt, AC, 20-ampere, fused, heavy duty safety switch in a NEMA-3R enclosure. The fuses shall be sized to suit the heat pump unit furnished.

## **MISCELLANEOUS MATERIALS**

### **Nameplates**

Nameplates shall be laminated phenolic plastic with white core and black front and back. Nameplate inscription shall be in capitals letters etched through the outer layer of the nameplate material.

## **PART 3.- EXECUTION**

### **INSTALLATION**

### **PTZ CCTV Camera**

PTZ CCTV camera shall be installed in locations as shown on the plans. Any additional hardware or cabling required to make them fully operational shall be provided and installed. The camera and dome shall be securely installed so they do not vibrate as operated through the complete range of motion. Entrance lane canopy cameras shall display image correctly (not upside down). The installer (with input from the Engineer) will set up the primary view and 2 additional views per each canopy camera. The installer (with input from the Engineer) will set up the primary view, 2 additional views, and a tour program for the PTZ camera on the pole. The installer shall allow an additional 2 hours for setting up motion detection areas per the Engineer's direction.

**Panelboard Installation.**--Set cabinets plumb and symmetrical with building lines. Train interior wiring as specified under "Conductor and Cable Installation" in "Basic Materials and Methods" of these special provisions. Touch-up paint any marks, blemishes, or other finish damage suffered during installation. Replace cabinets, doors or trim exhibiting dents, bends, warps or poor fit which may impede ready access, security or integrity.

Mounting height shall be as shown on the plans.

Where "Future" or "Space" is indicated on the plans, branch connectors, mounting brackets, and other hardware shall be furnished and installed for future breaker.

A typewritten directory under transparent protective cover shall be provided and set in metal frame inside each cabinet door. Directory panel designation for each circuit breaker shall include complete information concerning equipment controlled, including room number or area designated on the plans.

**Equipment Identification.**--Equipment shall be identified with nameplates fastened with self-tapping, cadmium-plated screws or nickel-plated bolts.

Nameplate inscriptions shall read as shown on the plans and as follows:

Item	Letter height (mm)	Inscription
Load Center G	8	Load Center G 120/208Volt, 3 Phase, 4 Wire
Outside Lighting Control Panel	8	Outside Light Controls

**Emergency Pump Shutoff Sign.**--Emergency pump shutoff sign with the message "EMERGENCY PUMP SHUTOFF" shall be fastened to the wall at the emergency pump shutoff switch with at least six anchorage devices.

### **TESTING**

#### **Gates Control Panel**

Gate control panel shall be tested after the gates are installed and operational. All functions of the control panel shall be verified to be operating correctly. If necessary conductors at the gate operators may need to be reconnected so the selector switches work correctly.

#### **Signal Lists Control Station**

Signal lists control station shall be tested after the signal lights are installed. Every signal light shall be verified to come on when the appropriate selector switch for it is operated. Pilot lights shall come on with the corresponding signal light.

#### **PTZ CCTV Camera**

PTZ CCTV camera testing shall only occur after all gates, guard booth, and canopy equipment is installed and operational. Each camera dome shall have all pan tilt zoom and heating/cooling features verified. Camera image at close and far range shall be verified for each camera. All preset positions, motion detection areas and tours shall be verified. Communication protocols shall be verified. Lock out protection levels and passwords shall be set up. Cameras shall be operated in both daylight and night light conditions. After the cameras have passed all set up and testing requirements and are fully operation, an additional 2 hour of on-site training shall be provided (for up to 8 personnel). Furthermore an additional 3 hours of follow up onsite training for the PTZ camera dome system shall be given to up to 8 personnel on site (up to 2 months after the installation is completed). This training may be set up by the Engineer in minimum 1 hour blocks of time. The Contractor shall bring all materials as required to provide the training.

## **12-16.04 LIGHTING**

**GENERAL.**--This work shall consist of furnishing, installing and connecting all lighting equipment in accordance with the details shown on the plans and these special provisions.

**SUBMITTALS.**--Manufacturer's descriptive information, photometric curves, catalog cuts, and installation instructions shall be submitted for approval. Any other data as requested by the Engineer shall also be submitted for approval.

### **PRODUCTS**

#### **Lighting Fixture Lamps**

Lighting fixture lamps shall be type and size as shown on the plans. Lamps shall be General Electric, Phillips, Sylvania, or equal. Fluorescent lamps, unless otherwise noted, shall be 4100K tri-phosphor with a CRI of 70 or greater.

#### **Ballasts**

All fixtures shall be equipped with high power factor ballasts suitable for the line voltage and for the type, size and number of lamps required by the fixture. Fluorescent ballasts shall be UL Listed, Class P and ETL Certified ballasts with sound rating A. Fluorescent ballasts shall be high-frequency electronic ballasts with power factor greater than 0.95, nominal ballast factor of 0.88 unless specified otherwise, total harmonic distortion less than 20 percent, crest factor less than or equal to 1.7, complying with ANSI C 62.41 Category A for surge protection, and FCC Part 18 for interference. Dimming ballasts shall be high frequency ballasts as specified above and shall be capable of dimming the light output from 100 percent to 20 percent of the rated light output.

#### **Lighting Fixtures**

Lighting fixtures shall be as shown on the plans and as specified herein. Outdoor luminaires shall be listed and labeled "Fixture Suitable For Wet Locations."

#### **F1**

Ceiling-mounted low profile fluorescent fixture with two 32WT8 lamps, electronic dimming ballast and one-piece, clear acrylic, wrap-around diffuser. Prudential Lighting , Catalog No. P-1702 2T8 04 PRA TMW SC 120 SUR DM; Columbia Lighting, Catalog No. AWW4-232-with dimming ballast; Lithonia, Catalog No. AW232 with dimming ballast; or equal.

#### **F2**

Ceiling-mounted fluorescent fixture with one 32WT8 lamp, electronicballast and baked enamel ribbed reflector, complete with end plates. The fixture shall be Lithonia, Catalog No. CB1 32 120 GEB10IS; Columbia Lighting , Catalog No. PT8-132-EB8120; Lamar Lighting, Catalog No. WN132E81; or equal.

#### **F3**

Surface mounted damp location rated fluorescent fixture with two 32-watt T8 lamps, integral electronic ballast and high efficiency reflector, and gasketed enclosure. The fixture shall be Lithonia, Series \_DM; Holophane, HES Series: Crescent Lighting , Series SLT; or equal.

#### **I1**

Outdoor rated surface mounted canopy LED fixture shall be low profile cast aluminum housing with high brightness LEDs, 7500 minimum initial delivered lumens at up to 6000K color temperature, with symmetric light distribution pattern and minimum 70 CRI. Fixture shall come with fused and surge protected integral driver with maximum drive current of 450 mA, be suitable for wet locations and have powder coat white finish. Fixture shall come with all associated hardware for surface mounting below the soffit. Fixture manufacturer shall be on the approved LED Manufacturers list of the Design lights Consortium. Fixture shall be Acuity Brands, catalog number TLRPG15-8600-SYM-MVOLT-SR-SF-DWH; LSI Industries, catalog number XPG3P-S-LED-68-450-NW-UE-WHT; Beta LED, catalog number CAN-EDG-PS-DM-10-C-UL-WH; or equal.



### **Photoelectric Unit, PC**

Photoelectric unit shall be cadmium sulfide photoelectric control with capacity of 600-watt incandescent or 600-watt inductive or fluorescent load, mounting adapter, and EEI-NEMA twist lock receptacle; Fisher-Pierce, Ripley, or equal.

### **Outside Lighting Control Station, OLCS**

Outside lighting control station shall consist of a lighting contactor, bypass timer switch, selector switches, disconnect switch, time clock and terminal blocks in a surface mounted NEMA-12 enclosure with a hinged door.

### **Lighting Contactor, LC**

Lighting contactor shall be electrically held, 2-pole combination lighting contactor with 120-volt AC coil and 30-ampere, double-break, silver alloy contacts; Square D Company, I.T.E., Westinghouse, or equal.

### **Bypass Timer Switch**

Bypass timer switch shall be the same as timer switches elsewhere in these general conditions.

### **Time Clock**

Time clock shall be a 120-volt, AC, solid-state programmable timer with power, on-off and manual override features. Time clock shall be able to program for a minimum of 3 independent schedules for any days of the week, in addition to being able to skip selected days. Time clock shall have a single-pole, double throw output contact rated at not less than 16-ampere, 120-volt, AC.

### **Selector Switch, SS1 and SS2**

Selector switch shall be rotary action, double-pole, 2-position, 10-ampere, 120-volt switch. Switch contacts shall have an inductive pilot duty rating of 60 amperes (make), 6 amperes (break) and 10 amperes (continuous) at 120 volts and 35 percent power factor. Selector switch shall have legend plate marked MANUAL-AUTO.

### **Disconnect Switch, DS**

Disconnect switch shall be a 20 ampere rated snap switch as specified elsewhere in these General Conditions.

### **Outside Lighting Control Station Enclosure**

Outside lighting control station enclosure shall be a single door NEMA Type 12, 355 mm high x 305 mm wide x 200 mm deep enclosure, conforming to the joint industry conference standards.

### **Terminal Block, TB**

Terminal block shall be 20-ampere, 240-volt, molded plastic with two or more mounting holes and two or more terminals in each cast block. The molded plastic shall have a high resistance to heat, moisture, mechanical shock, and electrical potential and shall have a smooth even finish. Each block shall have a molded marking strip attached with screws. Terminal blocks shall have tubular, high pressure clamp connectors.

## **FABRICATION**

**Component Mounting.**--The following electrical components shall be mounted on the back panel of the Outside Lighting Control Panel enclosure, OLCS:

Terminal Block, TB  
Lighting Contactor, LC  
Time Clock  
Neutral Buss

The following electrical components shall be mounted on the hinged door of the Outside light control Panel enclosure, OLCS:

Bypass Timer Switch, BTS1  
Disconnect Switch, DS

## EXECUTION

**Lighting Fixtures.**--Lighting fixtures shall be mounted securely in accordance with the manufacturer's recommendations. Mounting methods shall be suitable for the particular type of ceiling or support at each location.

The Contractor shall provide all supports, hangers, spacers, channels, fasteners and other hardware necessary to support the fixtures.

Fixtures shall be set at the mounting heights shown on the plans, except heights shown shall be adjusted to meet conditions.

**Ballasts.**--All fluorescent fixtures shall be equipped with high power factor ballasts suitable for the line voltage and for the type, size and number of lamps required by fixture. The Contractor has the option to install low voltage dimming control provided that the Contractor submit plans and specifications with appropriate revisions for the low voltage dimming control to the Engineers for approval prior to installation.

All ballasts used in unheated areas inside the building shall be -20°C ballasts or less.

## 12-16.05 LIGHT EMITTING DIODE SIGNAL MODULE

### GENERAL

#### Summary

This work includes installing LED signal module. Comply with Section 86, "Electrical Systems," of the Standard Specifications.

Use LED signal module as the light source for the following traffic signal faces:

1. Two 305 mm LED sections (green and red side by side in a horizontal traffic signal housing)
2. 305 mm Red flashing LED section
3. 305 mm Yellow LED section

#### Submittals

Before shipping LED signal modules to job site, submit the following to the Transportation Laboratory:

1. Delivery form including district number, EA, and contact information
2. List containing all LED signal module serial numbers anticipated for use
3. LED signal modules

#### Quality Control and Assurance

Module must be one listed on the Pre-Qualified Products List for LED traffic signals at:

[http://www.dot.ca.gov/hq/esc/approved\\_products\\_list](http://www.dot.ca.gov/hq/esc/approved_products_list)

The State will test LED signal module shipments as specified in ANSI/ASQ Z1.4.. Testing will be completed within 30 days of delivery to the Transportation Laboratory. LED signal modules tested or submitted for testing must be representative of typical production units. LED and circular LED signal modules will be tested as specified in California Test 604. All parameters of the specification may be tested on the modules. LEDs must be spread evenly across the module. Measurements will be performed at the rated operating voltage of 120 V(ac).

Delays resulting from submittal of non-compliant materials do not relieve you from executing the contract within the allotted time. Non-compliant materials will be rejected. You must resubmit new LED for retesting and pick up the failed units within 7 days of notification. You must provide new LED signal modules and allow a minimum of 30 days for the retest. You must pay for all shipping and handling costs related to testing and retesting. Delays resulting from resubmittal and retesting are your responsibility and no extra time will be allowed.

After testing, you must pick up the tested LED signal modules from the Transportation Laboratory and deliver to the job site.

## **Warranty**

The manufacturer must provide a written warranty against defects in materials and workmanship for LED signal modules for a minimum period of 48 months after installation of LED signal modules. Replacement LED signal modules must be provided within 15 days after receipt of failed LED modules at your expense. The State pays for shipping the failed modules to you. All warranty documentation must be submitted to the Engineer before installation. Replacement LED signal modules must be delivered to the U.S. Coast Guard on Yerba Buena Island.

## **MATERIALS**

Minimum power consumption for LED signal module must be 5 W.

LED signal module must have an operational lifecycle rating of 48 months. During the operational lifecycle, LED signal module must meet all parameters of this specification.

LED signal module must be designed for installation in the door frame of standard traffic signal housing.

LED signal module must:

1. Be 4 pounds maximum weight
2. Be manufactured for 305 mm circular section
3. Be from the same manufacturer
4. Be the same model for each size
5. Be sealed units with:
  - 5.1. 2 color-coded conductors for power connection, except for lane control LED signal modules use 3 color-coded conductors.
  - 5.2. Printed circuit board and power supply contained inside and complying with Chapter 1, Section 6 of TEES published by the Department.
  - 5.3. Lens that is:
    - 5.3.1. Integral to the units
    - 5.3.2. Convex or flat with a smooth outer surface
    - 5.3.3. Made of UV stabilized plastic or glass, and withstands UV exposure from direct sunlight for 48 months without exhibiting evidence of deterioration
  - 5.4. 1-piece EPDM gasket
6. Include 915 mm conductors with quick disconnect terminals attached
7. Be sealed in door frames
8. Fit into existing traffic signal section housing and comply with ITE publication, Equipment and Material Standards, Chapter 2, "Vehicle Traffic Control Signal Heads"

Individual LEDs must be wired so catastrophic loss or failure of 1 LED will not result in loss of more than 5 percent of the signal module light output. Failure of an individual LED in a string must not result in loss of entire string or other indication.

No special tools for installation are allowed.

## **12-inch Lane Control**

LED signal module must:

1. Be weather tight and connect directly to electrical wiring.
2. Be capable of optical unit replacement.
3. Be a single, self-contained device, ready for installation into traffic signal housing.
4. Have manufacturer's name, trademark, model number, serial number, lot number, month and year of manufacture, and required operating characteristics, including rated voltage, power consumption, and volt-ampere, permanently marked on the back of the module.
5. Have a symbol of module type and color. Symbol must be an inch in diameter. Color must be written out in 13 mm high letters next to the symbol.
6. Be AlInGaP technology for red and yellow indications and gallium nitride technology for green indications.
7. Be ultra bright type rated for 100,000 hours of continuous operation from -40 °C to +74 °C.
8. Have a maximum power consumption as follows:

### Power Consumption Requirements

LED Signal Module Type	Power Consumption (Watts)					
	Red		Yellow		Green	
	25 °C	74 °C	25 °C	74 °C	25 °C	74 °C
305 mm circular	11	17	22	25	15	15

Lens may be tinted, or may use transparent film or materials with similar characteristics to enhance "ON/OFF" contrasts. Tinting or other materials to enhance "ON/OFF" contrast must not affect chromaticity and must be uniform across the face of the lens.

If polymeric lens is used, surface coating or chemical surface treatment must be applied for front surface abrasion resistance.

Power supply must be integral to the module.

Internal components must be adequately supported to withstand mechanical shock and vibration from high winds and other sources.

Lens and LED signal module material must comply with the ASTM specifications for that material.

Enclosures containing either the power supply or electronic components of LED signal module, except lenses, must be made of UL94VO flame-retardant material.

If a specific mounting orientation is required, the LED signal module must have prominent and permanent vertical markings for accurate indexing and orientation within the signal housing. Markings must include an up arrow, or the word "UP" or "TOP."

LED signal module must meet or exceed the following values when operating at 25 °C:

Angle (v, h)	305 mm		
	Red	Yellow	Green
2.5, ±2.5	399	798	798
2.5, ±7.5	295	589	589
2.5, ±12.5	166	333	333
2.5, ±17.5	90	181	181
7.5, ±2.5	266	532	532
7.5, ±7.5	238	475	475
7.5, ±12.5	171	342	342
7.5, ±17.5	105	209	209
7.5, ±22.5	45	90	90
7.5, ±27.5	19	38	38
12.5, ±2.5	59	119	119
12.5, ±7.5	57	114	114
12.5, ±12.5	52	105	105
12.5, ±17.5	40	81	81
12.5, ±22.5	26	52	52
12.5, ±27.5	19	38	38
17.5, ±2.5	26	52	52
17.5, ±7.5	26	52	52
17.5, ±12.5	26	52	52
17.5, ±17.5	26	52	52
17.5, ±22.5	24	48	48
17.5, ±27.5	19	38	38

LED signal module must meet or exceed the following illumination values for 48 months when operating over a temperature range of -40 °C to + 74 °C. Yellow LED signal module must meet or exceed the following illumination values for 48 months, when operating at 25 °C:

Angle (v, h)	305 mm		
	Red	Yellow	Green
2.5, ±2.5	339	678	678
2.5, ±7.5	251	501	501
2.5, ±12.5	141	283	283
2.5, ±17.5	77	154	154
7.5, ±2.5	226	452	452
7.5, ±7.5	202	404	404
7.5, ±12.5	145	291	291
7.5, ±17.5	89	178	178
7.5, ±22.5	38	77	77
7.5, ±27.5	16	32	32
12.5, ±2.5	50	101	101
12.5, ±7.5	48	97	97
12.5, ±12.5	44	89	89
12.5, ±17.5	34	69	69
12.5, ±22.5	22	44	44
12.5, ±27.5	16	32	32
17.5, ±2.5	22	44	44
17.5, ±7.5	22	44	44
17.5, ±12.5	22	44	44
17.5, ±17.5	22	44	44
17.5, ±22.5	20	41	41
17.5, ±27.5	16	32	32

LED signal module must comply with the following chromaticity requirements for 48 months when operating over a temperature range of -40 °C to +74 °C.

**Chromaticity Standards (CIE Chart)**

Red	Y: not greater than 0.308, or less than 0.998 - x
Yellow	Y: not less than 0.411, nor less than 0.995 - x, nor greater than 0.452
Green	Y: not less than 0.506 - 0.519x, nor less than 0.150 + 1.068x, nor more than 0.730 - x

LED signal module must operate:

1. At a frequency of 60 Hz ±3 Hz, over a voltage range from 95 V(ac) to 135 V(ac), without perceptible flicker to the unaided eye. Fluctuations of line voltage must have no visible effect on luminous intensity of the indications. Rated voltage for measurements must be 120 V(ac).
2. Compatible with currently used controller assemblies, including solid state load switches, flashers, and conflict monitors. Comply with TEES Chapters 3 and 6. If a 20 mA alternating current or less is applied to the unit, the voltage read across the 2 leads must be 15 V(ac) or less.

Wiring and terminal block must comply with Section 13.02 of ITE publication, Equipment and Material Standards, Chapter 2, "Vehicle Traffic Control Signal Heads." Electrical connection for each Type 1 LED signal module must be 2 secured, color-coded, 0.9 m long, 600 V(ac), 20 AWG minimum stranded jacketed copper wires. Wires must comply with NEC, rated for service at +105 °C. Three wires must be used for lane control LED signal module.

LED signal module on-board circuitry must:

1. Include voltage surge protection to withstand high-repetition noise transients. The voltage surge protection must comply with NEMA Standard TS2, Section 2.1.6.
2. Comply with FCC, Title 47, SubPart B, Section 15 regulations for Class A emission limits for electronic noise.

LED signal module must provide a power factor of 0.90 or greater.

Total harmonic distortion from current and voltage induced into an alternating current power line by LED signal module must not exceed 20 percent at an operating temperature of 25 °C.

When power is applied to LED signal module, light emission must occur within 90 ms.

### **Red and Yellow Flashing LED Signal Module**

No external circuitry to flash the LED signal module is allowed. Use 12 V(dc) or 120 V(ac).

Flashing LED signal module circuitry must prevent perceptible light emission to the unaided eye when a voltage, 50 V(ac) or less for alternating current or 5 V(dc) for 12 V(dc) flasher units, is applied to the unit.

Electrical connection for each flashing LED signal module must be 4 secured, color-coded, 600 V(ac), 20 AWG minimum stranded jacketed copper wires. Wire must comply with NEC, rated for service at +105 °C. Conductors for flashing LED signal module must be 3 feet in length, with quick disconnect terminals attached. The color code is as follows:

**Color Code Requirements**

Function	Color
Neutral/DC common	white
Steady On	red
Flash On	brown
Flash Out	orange

Flashing LED signal module must include all necessary electronics to:

1. Operate in a "Steady On" mode
2. Perform, in "Flash On" mode, 50 to 60 flashes per minute with a 50 percent  $\pm$  5 duty cycle
3. Allow alternating flashing operation, wig-wag, if the "Steady On" input of another flashing LED signal module is connected

When power is applied to the "Flash On" control conductor, the control output must allow a 12 V(dc) or 120 V(ac) signal that is switched opposite of the flash state of the module. Output must be able to source a maximum of 2.5 A for 12 V(dc), or 0.3 A for 120 V(ac).

Do not use the power consumption from "Flash Out" output of the flashing LED signal module when determining maximum power consumption.

The flashing LED Signal module must be clearly marked on the back, as "DC FLASHER" or "AC FLASHER", in 13 mm letters.

**AMENDMENTS TO THE STANDARD SPECIFICATIONS  
DATED JULY 1999**





# **AMENDMENTS ISSUE DATE: 11-15-10**

## **SECTION 0 GLOBAL REVISIONS**

**(Issued 07-01-08)**

Global revisions are changes to contract documents not specific to a section of the Standard Specifications.

In each contract document at each occurrence:

1. Except where existing asphalt concrete is described, replace "asphalt concrete" with "hot mix asphalt"
2. Except where existing AC is described, replace "AC" with "HMA" where AC means asphalt concrete
3. Replace "Engineer's Estimate" with "verified Bid Item List"
4. Replace "Notice to Contractors" with "Notice to Bidders"
5. Except in "Contract Project Information Signs," replace "Project Information" with "Supplemental Project Information"

Where Standard Specifications refer to the special provisions to describe the work, interpret the reference to the Bid Item List, the special provisions, or both.

Interpret a reference to the Standard Specifications as a reference to the Standard Specifications as amended in these Amendments to the Standard Specifications.

^^

## **SECTION 1 DEFINITIONS AND TERMS**

**(Issued 11-15-10)**

**Replace Section 1 with:**  
**SECTION 1 GENERAL**  
**1-1 GENERAL**

### **1-1.01 GENERAL**

Section 1 includes general rules of interpretation.

The Department is gradually standardizing the style and language of the specifications. The new style and language includes:

1. Use of:
  - 1.1. Imperative mood
  - 1.2. Introductory modifiers
  - 1.3. Conditional clauses
2. Elimination of:
  - 2.1. Language variations
  - 2.2. Definitions for industry-standard terms
  - 2.3. Redundant specifications
  - 2.4. Needless cross-references

The use of this new style does not change the meaning of a specification not yet using this style.

The specifications are written to the Bidder before award and the Contractor after. Before award, interpret sentences written in the imperative mood as starting with "The Bidder must" and interpret "you" as "the Bidder" and "your" as "the Bidder's." After award, interpret sentences written in the imperative mood as starting with "The Contractor must" and interpret "you" as "the Contractor" and "your" as "the Contractor's."

Unless an object or activity is specified to be less than the total, the quantity or amount is all of the object or activity.

All items in a list apply unless the items are specified as choices.

Headings are included for the purposes of organization and referencing. Inclusion of a heading with no related content, "Reserved," or "Not Used" does not indicate that no specification exists for that subject; applicable specifications may be covered in a general or referenced specification.

## **1-2 REFERENCES**

### **1-2.01 REFERENCES**

A reference within parentheses to a law or regulation is included in the contract for convenience only and is not a comprehensive listing of related laws and regulations. Lack of a reference does not indicate no related laws or regulations exist.

If the version of a referenced document is not specified, use the current version in effect on the date of Notice to Bidders.

A reference to a subsection includes the section's general specifications of which the subsection is a part.

A code not specified as a Federal code is a California code.

### 1-3 ABBREVIATIONS AND MEASUREMENT UNITS

#### 1-3.01 ABBREVIATIONS

Abbreviations	
Abbreviation	Meaning
AAN	American Association of Nurserymen
AASHTO	American Association of State Highway and Transportation Officials
AISC	American Institute of Steel Construction
AISI	American Iron and Steel Institute
ANSI	American National Standards Institute
APHA	American Public Health Association
API	American Petroleum Institute
AREMA	American Railway Engineering and Maintenance-of-Way Association
ASME	American Society of Mechanical Engineers
ASTM	American Society for Testing and Materials
AWG	American Wire Gage
AWPA	American Wood-Preservers' Association
AWS	American Welding Society
AWWA	American Water Works Association
CIH	Certified Industrial Hygienist
DBE	Disadvantaged Business Enterprise
DVBE	Disabled Veteran Business Enterprise
EIA	Electronic Industries Alliance
ETL	Electrical Testing Laboratories
FHWA	Federal Highway Administration
IEEE	Institute of Electrical and Electronics Engineers
NETA	National Electrical Testing Association, Inc.
NEMA	National Electrical Manufacturers Association
PLAC	permit, license, agreement, certification, or any combination of these
SSPC	The Society for Protective Coatings
UL	Underwriters' Laboratories Inc.

### 1-3.02 MEASUREMENT UNITS

Some of the symbols for units of measurement used in the specifications and in the Bid Item List are defined as follows. The symbols for other units of measurement used in the specifications are as defined in ASTM E 380 or in the various specifications and test referenced in the specifications.

**Measurement Units**

Symbols as used in the specifications	Symbols as used in the Bid Item List	Meaning
A	—	amperes
—	EA	each
g	G	gram
kg	KG	kilogram
ha	HA	hectare (10 000 m <sup>2</sup> )
h	H	hour
J	—	joule
—	LNKM	lane kilometer
L	L	liter
—	LS	lump sum
m	M	meter
km	KM	kilometer
mm	MM	millimeter
μm	—	micrometer
nm	—	nanometer
m <sup>2</sup>	M2	square meter
m <sup>3</sup>	M3	cubic meter
N	—	newton
N·m	—	newton meter
Ω	—	ohm
Pa	—	pascal
kPa	—	kilopascal
MPa	—	megapascal
s	—	second
—	STA	station (100 m)
—	TAB	tablet
tonne	TONN	metric ton (1000 kg)
W	—	watt

### 1-4 DEFINITIONS

#### 1-4.01 GENERAL

Interpret terms as defined in the contract documents. A construction-industry term not defined in the contract documents has the meaning defined in Means Illustrated Construction Dictionary, Condensed Version, Second Edition.

#### 1-4.02 GLOSSARY

**acceptance:** Formal written acceptance by the Director of an entire contract that has been completed in all respects in accordance with the plans and specifications and any modifications to them previously approved.

**base:** Layer of specified material of planned thickness placed immediately below the pavement or surfacing.

**basement material:** Material in excavation or embankments underlying the lowest layer of subbase, base, pavement, surfacing, or other specified layer to be placed.

**bid item:** Specific work unit for which the bidder provides a price.

**Bid Item List:** List of bid items and the associated quantities.

**Bid Item List, verified:** Bid Item List with verified prices. The Contract Proposal of Low Bidder at the Department's Web site is the verified Bid Item List.

**bridge:** Structure, with a bridge number, that carries a utility facility, or railroad, highway, pedestrian or other traffic, over a water course or over or under or around any obstruction.

**building-construction contract:** Contract that has "building construction" on the cover of the Notice to Bidders and Special Provisions.

**business day:** Day on the calendar except Saturday or holiday.

**California Manual on Uniform Traffic Control Devices:** The California Manual on Uniform Traffic Control Devices for Streets and Highways (California MUTCD) is issued by the Department of Transportation and is the Federal Highway Administration's MUTCD 2003 Edition, as amended for use in California.

**Certified Industrial Hygienist:** Industrial hygienist certified in comprehensive practice by the American Board of Industrial Hygiene.

**conduit:** Pipe or tube in which smaller pipes, tubes, or electrical conductors are inserted or are to be inserted.

**contract:** Written and executed contract between the Department and the Contractor.

**contract bonds:** Security for the payment of workers and suppliers furnishing materials, labor, and services and for guaranteeing the Contractor's work performance.

**contract item:** Bid item.

**Contractor:** Person or business or its legal representative entering into a contract with the Department for performance of the work.

**culvert:** Structure, other than a bridge, that provides an opening under a roadway for drainage or other purposes.

**day:** 24 consecutive hours running from midnight to midnight; calendar day.

**deduction:** Amount of money permanently taken from progress payment and final payment. Deductions are not retentions under Pub Cont Code § 7107.

**Department:** Department of Transportation as defined in St & Hwy Code § 20 and authorized in St & Hwy Code § 90; its authorized representatives.

**detour:** Temporary route for traffic around a closed road part. A passageway through a job site is not a detour.

**Director:** Department's Director.

**Disabled Veteran Business Enterprise:** Business certified as a DVBE by the Office of Small Business and DVBE Services, Department of General Services.

**divided highway:** Highway with separated traveled ways for traffic, generally in opposite directions.

**Engineer:** Department's Chief Engineer acting either directly or through properly authorized agents; the agents acting within the scope of the particular duties delegated to them.

**Federal-aid contract:** Contract that has a Federal-aid project number on the cover of the Notice to Bidders and Special Provisions.

**fixed costs:** Labor, material, or equipment cost directly incurred by the Contractor as a result of performing or supplying a particular bid item that remains constant regardless of the item's quantity.

**frontage road:** Local street or road auxiliary to and located generally on the side of an arterial highway for service to abutting property and adjacent areas and for control of access.

**grading plane:** Basement material surface on which the lowest layer of subbase, base, pavement, surfacing, or other specified layer is placed.

**highway:** Whole right of way or area that is reserved for and secured for use in constructing the roadway and its appurtenances.

**holiday:**

1. Every Sunday
2. January 1st, New Year's Day
3. 3rd Monday in January, Birthday of Martin Luther King, Jr.
4. February 12th, Lincoln's Birthday
5. 3rd Monday in February, Washington's Birthday
6. March 31st, Cesar Chavez Day
7. Last Monday in May, Memorial Day
8. July 4th, Independence Day
9. 1st Monday in September, Labor Day
10. 2nd Monday in October, Columbus Day
11. November 11th, Veterans Day
12. 4th Thursday in November, Thanksgiving Day
13. Day after Thanksgiving Day
14. December 25th, Christmas Day

If January 1st, February 12th, March 31st, July 4th, November 11th, or December 25th falls on a Sunday, the Monday following is a holiday. If November 11th falls on a Saturday, the preceding Friday is a holiday. Interpret "legal holiday" as "holiday."

**informal-bid contract:** Contract that has "Informal Bid Authorized by Pub Cont Code §10122" on the cover of the Notice to Bidders and Special Provisions.

**Information Handout:** Supplemental project information furnished to bidders as a handout.

**laboratory:** Laboratory authorized by the Department to test materials.

**liquidated damages:** Amount prescribed in the specifications, pursuant to the authority of Pub Cont Code § 10226, to be paid to the State or to be deducted for each day's delay in completing the whole or any specified portion of the work beyond the time allowed in the specifications.

**median:** Portion of a divided highway separating the traveled ways for traffic in opposite directions including inside shoulders.

**Notice to Bidders:** Document that provides a general work description, bidder and bid specifications, and the time and location the Department receives bids.

**pavement:** Uppermost layer of material placed on the traveled way or shoulders. This term is used interchangeably with surfacing.

**plans:** Official project plans and Standard Plans, profiles, typical cross sections, working drawings and supplemental drawings, or reproductions thereof, approved by the Engineer, which show the location, character, dimensions and details of the work to be performed. These documents are to be considered as a part of the plans.

In the above definition, the following terms are defined as follows:

**Standard Plans:** Standard Plans issued by the Department.

**project plans:** Specific details and dimensions peculiar to the work supplemented by the Standard Plans insofar as the same may apply.

**roadbed:** Area between the intersection of the upper surface of the roadway and the side slopes or curb lines. The roadbed rises in elevation as each increment or layer of subbase, base, surfacing or pavement is placed. Where the medians are so wide as to include areas of undisturbed land, a divided highway is considered as including 2 separate roadbeds.

**roadway:** Highway portion included between the outside lines of sidewalks, or curbs, slopes, ditches, channels, waterways, and including all the appertaining structures, and other features necessary to proper drainage and protection.

**shoulder:** Roadway portion contiguous with the traveled way for accommodation of stopped vehicles, for emergency use, and for lateral support of base and surface courses.

**special provisions:** Specific clauses setting forth conditions or requirements peculiar to the work and supplementary to these Standard Specifications. The Department's publication titled "Labor Surcharge And Equipment Rental Rates" is part of the special provisions.

**specifications:** Directions, provisions, and requirements contained in these Standard Specifications, Amendments to the Standard Specifications, and the special provisions. Where the term "these specifications" or "these Standard Specifications" is used in this book, it means the provisions set forth in this book.

**State:** State of California, including its agencies, departments, or divisions, whose conduct or action is related to the work.

**Structure Design:** Offices of Structure Design of the Department.

**subbase:** Layer of specified material of planned thickness between a base and the basement material.

**subgrade:** Roadbed portion on which pavement, surfacing, base, subbase, or a layer of any other material is placed.

**substructure:** Bridge portions below the bridge seats, tops of piers, haunches of rigid frames, or below the spring lines of arches. Backwalls and parapets of abutments and wingwalls of bridges are portions of the substructure.

**superstructure:** Bridge portion except the bridge substructure.

**supplemental project information:** Information relevant to the project, specified as supplemental project information, and made available to bidders.

**surfacing:** Uppermost layer of material placed on the traveled way, or shoulders. This term is used interchangeably with pavement.

**traffic lane:** Portion of a traveled way for the movement of a single line of vehicles.

**traveled way:** Portion of the roadway for the movement of vehicles, exclusive of shoulders.

**total bid:** Sum of the item totals as verified by the Department; original contract price.

**withhold:** Money temporarily or permanently taken from progress payment. Withholds are not retentions under Pub Cont Code § 7107.

**work:** All the work specified, indicated, shown or contemplated in the contract to construct the improvement, including all alterations, amendments, or extensions to it made by contract change order or other written orders of the Engineer.



## 1-5 DISTRICTS

**District Composition and Office Addresses**

District	Counties	Location Address	Mailing Address
1	Del Norte (DN), Humboldt (Hum), Lake (Lak), Mendocino (Men)	1656 UNION ST EUREKA, CA	PO BOX 3700 EUREKA CA 95502
2	Lassen (Las), Modoc (Mod), Plumas (Plu), Shasta (Sha), Siskiyou (Sis), Tehama (Teh), Trinity (Tri)	1657 RIVERSIDE DR REDDING, CA	PO BOX 496073 REDDING CA 96049-6073
3	Butte (But), Colusa (Col), El Dorado (ED), Glenn (Gle), Nevada (Nev), Placer (Pla), Sacramento (Sac), Sierra (Sie), Sutter (Sut), Yolo (Yol), Yuba (Yub)	703 B ST MARYSVILLE, CA	PO BOX 911 MARYSVILLE CA 95901
4	Alameda (Ala), Contra Costa (CC), Marin (Mrn), Napa (Nap), San Francisco (SF), San Mateo (SM), Santa Clara (SCI), Solano (Sol), Sonoma (Son)	111 GRAND AVE OAKLAND, CA	PO BOX 23660 OAKLAND CA 94623-0660
5	Monterey (Mon), San Benito (SBt), San Luis Obispo (SLO), Santa Barbara (SB), Santa Cruz (SCr)	50 HIGUERA ST SAN LUIS OBISPO, CA	50 HIGUERA ST SAN LUIS OBISPO CA 93401-5415
6	Fresno (Fre), Kern (Ker), Kings (Kin), Madera (Mad), Tulare (Tul)	1352 W. OLIVE AVE FRESNO, CA	PO BOX 12616 FRESNO CA 93728-2616
7	Los Angeles (LA), Ventura (Ven)	100 S. MAIN ST LOS ANGELES	100 S MAIN ST LOS ANGELES CA 90012
8	Riverside (Riv), San Bernardino (SBd)	464 W 4TH ST SAN BERNARDINO, CA	464 W 4TH ST SAN BERNARDINO CA 92401-1400
9	Inyo (Iny), Mono (Mno)	500 S MAIN ST BISHOP, CA	500 S MAIN ST BISHOP CA 93514-3423
10	Alpine (Alp), Amador (Ama), Calaveras (Cal), Mariposa (Mpa), Merced (Mer), San Joaquin (SJ), Stanislaus (Sta), Tuolumne (Tuo)	1976 E CHARTER WAY STOCKTON, CA	PO BOX 2048 STOCKTON CA 95201
11	Imperial (Imp), San Diego (SD)	4050 TAYLOR ST SAN DIEGO, CA	4050 TAYLOR ST SAN DIEGO CA 92110-2737
12	Orange (Ora)	3347 MICHELSON DR STE 100 IRVINE, CA	3347 MICHELSON DR STE 100 IRVINE CA 92612-0661

A project with work in District 1, 2, or 3 is a North Region project. For Districts 1, 2, and 3, interpret each reference to the district office as the North Region office. The North Region office address is the District 3 address.



## 1-6 WEB SITES, ADDRESSES, AND TELEPHONE NUMBERS

Web Sites, Addresses, and Telephone Numbers			
Agency, Department Unit, or Reference	Web Site	Address	Telephone No.
Bidders' Exchange	<a href="http://www.dot.ca.gov/hq/esc/oe/bidex">www.dot.ca.gov/hq/esc/oe/bidex</a>	MSC 26 BIDDERS' EXCHANGE DEPARTMENT OF TRANSPORTATION 1727 30TH ST SACRAMENTO CA 95816-7005	(916) 227-6259
Department	<a href="http://www.dot.ca.gov">www.dot.ca.gov</a>		
Department of General Services, Office of Small Business and DVBE Services	<a href="http://www.pd.dgs.ca.gov/smbus/default.htm">www.pd.dgs.ca.gov/smbus/default.htm</a>	OFFICE OF SMALL BUSINESS AND DVBE SERVICES DEPARTMENT OF GENERAL SERVICES 707 3RD ST WEST SACRAMENTO CA 95605-2811	(800) 559-5529 (916) 375-4940
Department of Industrial Relations	<a href="http://www.dir.ca.gov">www.dir.ca.gov</a>		
Department of Industrial Relations, Division of Apprenticeship Standards		455 GOLDEN GATE AVENUE SAN FRANCISCO, CA 94102	
Division of Accounting, Office of External Accounts Payable	<a href="http://www.dot.ca.gov/hq/asc/oap/payments/contact.htm#conpets1">http://www.dot.ca.gov/hq/asc/oap/payments/contact.htm#conpets1</a>	MAJOR CONSTRUCTION PAYMENT AND INFORMATION UNIT OFFICE OF EXTERNAL ACCOUNTS PAYABLE DIVISION OF ACCOUNTING DEPARTMENT OF TRANSPORTATION P.O. BOX 168043 SACRAMENTO, CA 95816-8043	(916) 227-9013
Office Engineer		MSC 43 OFFICE ENGINEER DEPARTMENT OF TRANSPORTATION 1727 30TH ST SACRAMENTO CA 95816-7005	
Office Engineer– Verified Bid Results	<a href="http://www.dot.ca.gov/hq/esc/oe/awards/bids/um_html/6week_list.html">http://www.dot.ca.gov/hq/esc/oe/awards/bids/um_html/6week_list.html</a>		
Offices of Structure Design, Documents Unit		MSC 9-4/4I DOCUMENTS UNIT OFFICES OF STRUCTURE DESIGN DEPARTMENT OF TRANSPORTATION 1801 30TH ST SACRAMENTO CA 95816-7006	(916) 227-0716

Publication Distribution Unit		PUBLICATION UNIT DEPARTMENT OF TRANSPORTATION 1900 ROYAL OAKS DRIVE SACRAMENTO CA 95815-3800	
Transportation Laboratory		MATERIALS AND ENGINEERING TESTING SERVICES AND GEOTECHNICAL SERVICES DEPARTMENT OF TRANSPORTATION 5900 FOLSOM BLVD SACRAMENTO CA 95819-4612	(916) 227-7000
Department's Pre- Qualified Products List	<a href="http://www.dot.ca.gov/hq/esc/approved_products_list">http://www.dot.ca.gov/hq/esc/approved_products_list</a>		

^^

## SECTION 2 PROPOSAL REQUIREMENTS AND CONDITIONS (Issued 11-15-10)

### Replace Section 2 with: SECTION 2 BIDDING

#### 2-1.01 GENERAL

Section 2, "Bidding," includes specifications related to bid eligibility and the bidding process.

#### 2-1.02 BID INELIGIBILITY

A firm that has provided architectural or engineering services to the Department for this contract before bid submittal for this contract is prohibited from any of the following:

1. Submit a bid
2. Subcontract for a part of the work
3. Supply materials

#### 2-1.03 BID DOCUMENTS

##### 2-1.03A General

Standard Specifications and Standard Plans may be viewed at the Department's Web site and may be purchased at the Publication Distribution Unit.

Special provisions, Amendments to the Standard Specifications, and project plans may be viewed at the Bidders' Exchange. To obtain bid books, submit a request to the Bidders' Exchange. For an informal-bid contract, you may also obtain special provisions, Amendments to the Standard Specifications, and project plans at the Bidders' Exchange.

##### 2-1.03B Supplemental Project Information

Logs of test borings attached to the project plans are supplemental project information. The Department makes other supplemental information available as specified in the special provisions.

If an Information Handout is available, you may view it at:

[http://www.dot.ca.gov/hq/esc/oe/weekly\\_ads/index.php](http://www.dot.ca.gov/hq/esc/oe/weekly_ads/index.php)

If rock cores are available for inspection, you may view them by sending a request to [Coreroom@dot.ca.gov](mailto:Coreroom@dot.ca.gov). If other supplemental project information is available for inspection, you may view it by phoning in a request. Make your request at least 7 days before viewing. Include in your request:

1. District-County-Route
2. Contract number
3. Viewing date
4. Contact information, including telephone number.

For rock cores, also include the bridge number in your request.

If bridge as-built drawings are available:

1. For a project in District 1 through 6 or 10, you may request them from the Office of Structure Maintenance and Investigations, fax (916) 227-8357
2. For a project in District 7, 8, 9, 11, or 12, you may request them from the Office of Structure Maintenance and Investigations, fax (916) 227-8357, and are available at the Office of Structure Maintenance and Investigations, Los Angeles, CA, telephone (213) 897-0877

As-built drawings may not show existing dimensions and conditions. Where new construction dimensions are dependent on existing bridge dimensions, verify the field dimensions and adjust dimensions of the work to fit existing conditions.

## **2-1.04–2-1.10 RESERVED**

### **2-1.11 JOB SITE AND DOCUMENT EXAMINATION**

Examine the job site and bid documents.

Bid submission is your acknowledgment that you have examined the job site and bid documents and are satisfied with:

1. General and local conditions to be encountered
2. Character, quality, and scope of work to be performed
3. Quantities of materials to be furnished
4. Character, quality, and quantity of surface and subsurface materials or obstacles
5. Requirements of the contract

### **2-1.12 BID DOCUMENT COMPLETION**

#### **2-1.12A General**

Complete forms in the Bid book.

On the Subcontractor List you may either submit each subcontracted bid item number and corresponding percentage with your bid or fax this information to (916) 227-6282 within 24 hours after bid opening. If you fail to submit this information within the time specified, your bid is nonresponsive.

Except for the bid item number and the percentage of each item subcontracted, do not fax submittals.

#### **2-1.12B Bid Item List and Bid Comparison**

Submit a bid based on the work item quantities the Department shows in the Bid Item List.

For a lump sum based bid, the Department compares bids based on the total price.

For a unit price based bid, the Department compares bids based on the sum of the item totals.

For a cost plus time based bid, the Department compares bids based on the sum of the item totals and the total bid for time. If your bid for time exceeds the number of working days described in the Notice to Bidders, your bid is nonresponsive.

#### **2-1.12C Subcontractor List**

In the Subcontractor List, list each subcontractor to perform work in an amount in excess of 1/2 of 1 percent of the total bid or \$10,000, whichever is greater (Pub Cont Code § 4100 et seq.)

The Subcontractor List must show the name, address, and work portions to be performed by each subcontractor listed. Show work portion by bid item number, description, and percentage of each bid item subcontracted.

### **2-1.13 BIDDER'S SECURITY**

Submit your bid with one of the following forms of bidder's security equal to at least 10 percent of the bid:

1. Cash
2. Cashier's check
3. Certified check
4. Bidder's bond signed by a surety insurer who is licensed in California

Make checks and bonds payable to the Department of Transportation.

If paying with a bidder's bond, you may use the form in the Bid book. If you do not use the form in the Bid book, use a form containing the same information.

## 2-1.14 BID SUBMITTAL

Submit your bid:

1. Under sealed cover
2. Marked as a bid
3. Identifying the contract number and the bid opening date

If an agent other than the authorized corporation officer or a partnership member signs the bid, file a Power of Attorney with the Department either before opening bids or with the bid. Otherwise, the bid may be nonresponsive.

### 2-1.15 BID WITHDRAWAL

You or an authorized agent may withdraw a bid before the bid opening date and time by submitting a written bid withdrawal request at the location where the bid was submitted. Withdrawing a bid does not prevent you from submitting a new bid.

After the bid opening time, you cannot withdraw a bid.

## 2-1.16 BID OPENING

The Department publicly opens and reads bids at the time and place described in the Notice to Bidders. The Department invites bidders or their authorized agents to attend.

## 2-1.17 BID REJECTION

The Department may reject:

1. All bids
2. A nonresponsive bid

### 2-1.18 BID RELIEF

The Department may grant bid relief under Pub Cont Code § 5100 et seq. Submit any request for bid relief to the Office Engineer. For Relief of Bid Request form, go to:

[http://www.dot.ca.gov/hq/esc/oe/contractor\\_info/relief.pdf](http://www.dot.ca.gov/hq/esc/oe/contractor_info/relief.pdf)

## 2-1.19 SUBMITTAL FAILURE HISTORY

The Department considers a bidder's past failure to submit documents required after bid opening in determining a bidder's responsibility.

## 2-1.20 BID RIGGING

Section 2-1.20, "Bid Rigging," applies to a Federal-aid contract.

The U.S. Department of Transportation (DOT) provides a toll-free hotline to report bid rigging activities. Use the hotline to report bid rigging, bidder collusion, and other fraudulent activities. The hotline number is (800) 424-9071. The service is available Monday through Friday between 11:00 a.m. and 8:00 p.m. and is confidential and anonymous. The hotline is part of the DOT's effort to identify and investigate highway construction contract fraud and abuse and is operated under the direction of the DOT Inspector General.

AA

## SECTION 3 AWARD AND EXECUTION OF CONTRACT

(Issued 11-15-10)

Replace Section 3 with:

### SECTION 3 CONTRACT AWARD AND EXECUTION

#### 3-1.01 SCOPE

Section 3, "Contract Award and Execution," includes specifications related to contract award and execution.

#### 3-1.02 CONTRACT AWARD

Submit any bid protest to the Office Engineer.

If the Department awards the contract, the award is made to the lowest responsible bidder within the number of days shown in the following table:

Contract Award Period	
Days (after bid opening)	Project Estimated Cost shown in the Notice to Bidders
30	< \$200 million
60	≥ \$200 million

The Department may extend the specified award period if the bidder agrees.

#### 3-1.03 CONTRACT BONDS (PUB CONT CODE §§ 10221 AND 10222)

The successful bidder must furnish:

1. Payment bond to secure the claim payments of laborers, workers, mechanics, or materialmen providing goods, labor, or services under the contract. This bond must be equal to at least 100 percent of the total bid.
2. Performance bond to guarantee the faithful performance of the contract. This bond must be equal to at least 50 percent of the total bid.

The Department furnishes the successful bidder with the bond forms.

#### 3-1.04 CONTRACTOR LICENSE

For a Federal-aid contract, the Bidder must be properly licensed (Pub Cont Code § 10164) from contract award through contract acceptance.

For a non-Federal-aid contract:

1. The Bidder must be properly licensed from bid opening through contract acceptance (Bus & Prof Code § 7028.15)
2. Joint venture bidders must obtain a joint venture license before contract award (Bus & Prof Code § 7029.1)

#### 3-1.05 INSURANCE POLICIES

The successful bidder must submit:

1. Copy of its commercial general liability policy and its excess policy or binder until such time as a policy is available, including the declarations page, applicable endorsements, riders, and other modifications in effect at the time of contract execution. Standard ISO form No. CG 0001 or similar exclusions are allowed if not inconsistent with Section 7-1.12, "Indemnification and Insurance." Allowance of additional exclusions is at the discretion of the Department.
2. Certificate of insurance showing all other required coverages. Certificates of insurance, as evidence of required insurance for the auto liability and any other required policy, shall set forth deductible amounts applicable to each policy and all exclusions that are added by endorsement to each policy. The evidence of insurance shall provide that no cancellation, lapse, or reduction of coverage will occur without 10 days prior written notice to the Department.
3. A declaration under the penalty of perjury by a CPA certifying the accountant has applied GAAP guidelines confirming the successful bidder has sufficient funds and resources to cover any self-insured retentions if the self-insured retention is over \$50,000.

If the successful bidder uses any form of self-insurance for workers compensation in lieu of an insurance policy, it shall submit a certificate of consent to self-insure under Labor Code § 3700.

**3-1.06–3-1.08 RESERVED**

**3-1.09 CONTRACT EXECUTION**

The successful bidder must sign the contract and return it to the Office Engineer along with:

1. Contract bonds
2. Documents identified in Section 3-1.05, "Insurance Policies"

For an informal-bid contract, the Office Engineer must receive these documents before the 5th business day after the bidder receives the contract. For all other contracts, the Office Engineer must receive these documents before the 10th business day after the bidder receives the contract.

The bidder's security may be forfeited for failure to execute the contract within the time specified (Pub Cont Code §§ 10181, 10182, and 10183).

The following is a copy of the Contract form:



STATE OF CALIFORNIA  
DEPARTMENT OF TRANSPORTATION  
CONTRACT NO. \_\_\_\_\_

This contract is entered into between the State of California's Department of Transportation and the Contractor named below:

\_\_\_\_\_  
CONTRACTOR'S NAME

The parties agree to comply with the terms of the following exhibits that are by this reference made a part of this contract.

Exhibit A - Bid book dated \_\_\_\_\_

Exhibit B - Notice to Bidders and Special Provisions dated \_\_\_\_\_

Exhibit C - Project Plans approved \_\_\_\_\_

Exhibit D - Standard Specifications dated \_\_\_\_\_

Exhibit E - Standard Plans dated \_\_\_\_\_

Exhibit F - Addenda \_\_\_\_\_

Exhibits A, B, C, and F are those exhibits identified with the same contract number as this contract.

**This contract has been executed by the following parties:**

**CONTRACTOR**

\_\_\_\_\_  
CONTRACTOR'S NAME (If other than an individual, state whether a corporation, partnership, etc.)

BY (Authorized Signature)

\_\_\_\_\_  
DATE SIGNED (Do not type)

\_\_\_\_\_  
PRINTED NAME AND TITLE OF PERSON SIGNING

\_\_\_\_\_  
FEDERAL EMPLOYER IDENTIFICATION NUMBER

\_\_\_\_\_  
LICENSE NUMBER

**DEPARTMENT OF TRANSPORTATION**

BY (Authorized Signature)

\_\_\_\_\_  
DATE SIGNED (Do not type)

\_\_\_\_\_  
PRINTED NAME AND TITLE OF PERSON SIGNING

**This contract has been certified as complying with the State Contract Act:**

BY (Authorized Signature)

\_\_\_\_\_  
DATE SIGNED (Do not type)

\_\_\_\_\_  
PRINTED NAME AND TITLE OF PERSON SIGNING

**ADA Notice** For individuals with sensory disabilities, this document is available in alternate formats. For information call (916) 654-6410 or TDD (916) 654-3880 or write Records and Forms Management, 1120 N Street, MS-89, Sacramento, CA 95814.

**3-1.10 BIDDERS' SECURITIES**

The Department keeps the securities of the 1st, 2nd, and 3rd low bidders until the contract has been executed. The other bidders' securities, other than bidders' bonds, are returned upon determination of the 1st, 2nd, and 3rd low bidders, and their bidders' bonds are of no further effect (Pub Cont Code § 10184).

## SECTION 4 SCOPE OF WORK

**(Issued 07-01-08)**

**Add to Section 4-1.01:**

Nothing in the specifications voids the Contractor's public safety responsibilities.

**Add:**

#### 4-1.015 PROJECT DESCRIPTION

Construct the work described in the special provisions and on project plans and by the bid items. The special provisions, project plans, and bid item descriptions set forth the specifications that apply.

**Add:**

#### 4-1.035 VALUE ENGINEERING

#### 4-1.035A General

Reserved

#### 4-1.035B Value Engineering Change Proposal

You may submit a VECP to reduce any of the following:

1. Total cost of construction
2. Construction activity duration
3. Traffic congestion

Before preparing a VECP, meet with the Engineer to discuss:

1. Proposal concept
2. Permit issues
3. Impact on other projects
4. Project impacts, including traffic, schedule, and later stages
5. Peer reviews
6. Overall proposal merits
7. Review times required by the Department and other agencies

The VECP must not impair the project's essential functions or characteristics, such as:

1. Service life
2. Operation economy
3. Maintenance ease
4. Desired appearance
5. Design and safety

The VECP must include:

1. Description of the contract specifications and drawing details for performing the work and the proposed changes.
2. Itemization of contract specifications and drawing details that would be changed.
3. Detailed cost estimate for performing the work under the existing contract and under the proposed change. Determine the estimates under Section 9-1.03, "Force Account Payment."
4. Deadline for the Engineer to decide on the changes.
5. Bid items affected and resulting quantity changes.



The Department is not required to consider a VECP. If a VECP is similar to a change in the plans or specifications being considered by the Department at the time the proposal is submitted or if the proposal is based on or similar to drawings or specifications adopted by the Department before Contract award, the Department does not accept the VECP and may make these changes without VECP payments.

Until the Department approves a change order incorporating the VECP or parts of it, continue to perform the work under the contract. If the Department does not approve a change order before the deadline stated in the VECP or other date you subsequently stated in writing, the VECP is rejected. The Department does not adjust time or payment for a rejected VECP.

The Department decides whether to accept a VECP and the estimated net construction-cost savings from adopting the VECP or parts of it.

The Department may require you to accept a share of the investigation cost as a condition of reviewing a VECP. After written acceptance, the Department considers the VECP and deducts the agreed cost.

If the Department accepts the VECP or parts of it, the Department issues a change order that:

1. Incorporates changes in the contract necessary to implement the VECP or the parts adopted
2. Includes the Department's acceptance conditions
3. States the estimated net construction-cost savings resulting from the VECP
4. Obligates the Department to pay you 50 percent of the estimated net savings

In determining the estimated net construction-cost savings, the Department excludes your VECP preparation cost and the Department's VECP investigation cost, including parts paid by you.

If a VECP providing for a reduction in working days is accepted by the Department, 50 percent of the reduction is deducted from contract time.

If a VECP providing for a reduction in traffic congestion or avoiding traffic congestion is accepted by the Department, the Department pays 60 percent of the estimated net savings in construction costs attributable to the VECP. Submit detailed traffic handling comparisons between the existing contract and the proposed change, including estimates of the traffic volumes and congestion.

The Department may apply an accepted VECP for general use on other contracts.

If an accepted VECP is adopted for general use, the Department pays only the contractor who first submitted the VECP and only to the contracts awarded to that contractor before the submission of the accepted VECP.

If the Department does not adopt a general-use VECP, an identical or similar submitted proposal is eligible for acceptance.

#### **4-1.035C Value Analysis Workshop**

Section 4-1.035C, "Value Analysis Workshop," applies to a non-building-work contract with a total bid of over \$5 million.

You may request a value analysis workshop by submitting a request after contract approval.

The Department offers a value analysis workshop to:

1. Identify value enhancing opportunities
2. Consider changes to the contract that will reduce the total cost of construction, construction activity duration, or traffic congestion without impairing the essential functions specified for a VECP in Section 4-1.035B, "Value Engineering Change Proposal."

If the request is authorized, you and the Engineer:

1. Schedule a value analysis workshop
2. Select a facilitator and workshop site
3. Agree to other workshop administrative details

The workshop must be conducted under the methods described in the Department's Value Analysis Team Guide available at:

<http://www.dot.ca.gov/hq/oppd/value/>

The facilitator must be a certified value specialist as recognized by the Society of American Value Engineers.

The Department reimburses you for 1/2 of the workshop cost. The workshop cost is the sum of the workshop-facilitator cost and the workshop-site cost. The Department determines the workshop cost based on the facilitator

and workshop-site invoice prices minus any available or offered discounts. The Department does not pay you for any other associated costs.

AA

## SECTION 5 CONTROL OF WORK

**(Issued 11-15-10)**

**Add:**

### 5-1.005 GENERAL

Failure to comply with any specification part is a waiver of your right to an adjustment of time and payment related to that part.

After contract approval, submit documents and direct questions to the Engineer. Orders, approvals, and requests to the Contractor are by the Engineer.

The Engineer furnishes the following in writing:

1. Approvals
2. Notifications
3. Orders

The Contractor must furnish the following in writing:

1. Assignments
2. Notifications
3. Proposals
4. Requests, sequentially numbered
5. Subcontracts
6. Test results

The Department rejects a form if it has any error or any omission.

## Convert foreign language documents to English.

Use contract administration forms available at the Department's Web site.

If the last day for submitting a document falls on a Saturday or holiday, it may be submitted on the next business day with the same effect as if it had been submitted on the day specified.

**Add to 5-1.01:**

Failure to enforce a contract provision does not waive enforcement of any contract provision.

**Add:**

## 5-1.012 PARTNERING

### 5-1.012A General

The Department strives to work cooperatively with all contractors; partnering is our way of doing business. The Department encourages project partnering among the project team, made up of significant contributors from the Department and the Contractor, and their invited stakeholders.

For a project with a total bid greater than \$1 million, professionally facilitated project partnering is encouraged.

For a project with a total bid greater than \$10 million, professionally facilitated project partnering is required.

In implementing project partnering, you and the Engineer manage the contract by:

1. Using early and regular communication with involved parties
2. Establishing and maintaining a relationship of shared trust, equity, and commitment
3. Identifying, quantifying, and supporting attainment of mutual goals
4. Developing strategies for using risk management concepts
5. Implementing timely communication and decision making

6. Resolving potential problems at the lowest possible level to avoid negative impacts
7. Holding periodic partnering meetings and workshops as appropriate to maintain partnering relationships and benefits throughout the life of the project
8. Establishing periodic joint evaluations of the partnering process and attainment of mutual goals

Partnering does not void any contract part.

The Department's "Field Guide to Partnering on Caltrans Construction Projects" current at the time of bid is available to the project team as reference. This guide provides structure, context, and clarity to the partnering process requirements. This guide is available at the Department's Partnering Program website:

<http://www.dot.ca.gov/hq/construc/partnering.html>

In implementing project partnering, the project team must:

1. Create a partnering charter that includes:
  - 1.1. Mutual goals, including core project goals and may also include project-specific goals and mutually supported individual goals.
  - 1.2. Partnering maintenance and close-out plan.
  - 1.3. Dispute resolution plan that includes a dispute resolution ladder and may also include use of facilitated dispute resolution sessions.
  - 1.4. Team commitment statement and signatures.
2. Participate in monthly partnering evaluation surveys to measure progress on mutual goals and may also measure short-term key issues as they arise.
3. Evaluate the partnering facilitator on Forms CEM-5501 and CEM-5502. The Engineer provides the evaluation forms to the project team and collects the results. The Department makes evaluation results available upon request. Facilitator evaluations must be completed:
  - 3.1. At the end of the initial partnering workshop on Form CEM-5501.
  - 3.2. At the end of the project close-out partnering workshop on Form CEM-5502.
4. Conduct a project close-out partnering workshop.
5. Document lessons learned before contract acceptance.

#### **5-1.012B Partnering Facilitator, Workshops, and Monthly Evaluation Surveys**

The Engineer sends you a written invitation to enter into a partnering relationship after contract approval. Respond within 15 days to accept the invitation and request the initial and additional partnering workshops. After the Engineer receives the request, you and the Engineer cooperatively:

1. Select a partnering facilitator that offers the service of a monthly partnering evaluation survey with a 5-point rating and agrees to follow the Department's "Partnering Facilitator Standards and Expectations" available at the Department's Partnering Program website
2. Schedule initial partnering workshop
3. Determine initial workshop site and duration
4. Agree to other workshop administrative details

Additional partnering workshops and sessions are encouraged throughout the life of the project as determined necessary by you and the Engineer, recommended quarterly.

#### **5-1.012C Training in Partnering Skills Development**

For a project with a total bid of \$25 million or greater, training in partnering skills development is required.

For a project with a total bid between \$10 million and \$25 million, training in partnering skills is optional.

You and the Engineer cooperatively schedule the training session and select a professional trainer, training site, and 1 to 4 topics from the following list to be covered in the training:

1. Active Listening

2. Building Teams
3. Change Management
4. Communication
5. Conflict Resolution
6. Cultural Diversity
7. Dealing with Difficult People
8. Decision Making
9. Effective Escalation Ladders
10. Emotional Intelligence
11. Empathy
12. Ethics
13. Facilitation Skills
14. Leadership
15. Partnering Process and Concepts
16. Project Management
17. Project Organization
18. Problem Solving
19. Running Effective Meetings
20. Time Management
21. Win-Win Negotiation

Before the initial partnering workshop, the trainer conducts a 1-day training session in partnering skills development for the Contractor's and the Engineer's representatives. This training session must be a separate session from the initial partnering workshop and must be conducted locally. The training session must be consistent with the partnering principles under the Department's "Field Guide to Partnering on Caltrans Construction Projects."

Send at least 2 representatives to the training session. One of these must be your assigned representative as specified in Section 5-1.06, "Superintendence," of the Standard Specifications.

#### **5-1.012D Payment**

The Department pays you for:

1. 1/2 of partnering workshops and sessions based on facilitator and workshop site cost
2. 1/2 of monthly partnering evaluation survey service cost
3. Partnering skills development trainer and training site cost

The Department determines the costs based on invoice prices minus any available or offered discounts. The Department does not pay markups on these costs.

The Department does not pay for wages, travel expenses, or other costs associated with the partnering workshops and sessions, monthly partnering evaluation surveys, and training in partnering skills development.

#### **Add:**

#### **5-1.015 RECORDS**

##### **5-1.015A General**

Reserved

##### **5-1.015B Record Retention**

Retain project records from bid preparation through:

1. Final payment
2. Resolution of claims, if any

For at least 3 years after the later of these, retain cost records, including records of:

1. Bid preparation
2. Overhead
3. Payrolls
4. Payments to suppliers and subcontractors

## 5. Cost accounting

Maintain the records in an organized way in the original format, electronic and hard copy, conducive to professional review and audit.

### **5-1.015C Record Inspection, Copying, and Auditing**

Make your records available for inspection, copying, and auditing by State representatives for the same time frame specified under Section 5-1.015B, "Record Retention." The records of subcontractors and suppliers must be made available for inspection, copying, and auditing by State representatives for the same period. Before contract acceptance, the State representative notifies the Contractor, subcontractor, or supplier 5 business days before inspection, copying, or auditing.

If an audit is to start more than 30 days after contract acceptance, the State representative notifies the Contractor, subcontractor, or supplier when the audit is to start.

### **5-1.015D Cost Accounting Records**

Maintain cost accounting records for the project distinguishing between the following work cost categories:

1. Contract item work
2. Work character changes
3. Force account work
4. Extra work
5. Work performed under protests and claim notifications
6. Overhead
7. Subcontractors, suppliers, owner-operators, and professional services

Cost accounting records must include:

1. Final cost code lists and definitions
2. Itemization of the materials used and corresponding vendor's invoice copies
3. Direct cost of labor
4. Equipment rental charges
5. Workers' certified payrolls
6. Equipment:
  - 6.1. Size
  - 6.2. Type
  - 6.3. Identification number
  - 6.4. Hours operated

### **5-1.015E Extra Work Bills**

Maintain separate records for force account costs.

Within 7 days after performing the work, submit extra work bills using the Department's Internet extra work billing system.

The Contractor submitting and the Engineer approving an extra work bill using the Internet force account work billing system is the same as each party signing the report.

The Department provides billing system:

1. Training within 30 days of your written request
2. Accounts and user identification to your assigned representatives after a representative has received training

Each representative must maintain a unique password.

## **Replace Section 5-1.02A with:**

### **5-1.02A Excavation Safety Plans**

The Construction Safety Orders of the Division of Occupational Safety and Health shall apply to all excavations. For all excavations 1.5 m or more in depth, the Contractor shall submit to the Engineer a detailed plan

showing the design and details of the protective systems to be provided for worker protection from the hazard of caving ground during excavation. The detailed plan shall include any tabulated data and any design calculations used in the preparation of the plan. Excavation shall not begin until the detailed plan has been reviewed and approved by the Engineer.

Detailed plans of protective systems for which the Construction Safety Orders require design by a registered professional engineer shall be prepared and signed by an engineer who is registered as a Civil Engineer in the State of California, and shall include the soil classification, soil properties, soil design calculations that demonstrate adequate stability of the protective system, and any other design calculations used in the preparation of the plan.

No plan shall allow the use of a protective system less effective than that required by the Construction Safety Orders.

If the detailed plan includes designs of protective systems developed only from the allowable configurations and slopes, or Appendices, contained in the Construction Safety Orders, the plan shall be submitted at least 5 days before the Contractor intends to begin excavation. If the detailed plan includes designs of protective systems developed from tabulated data, or designs for which design by a registered professional engineer is required, the plan shall be submitted at least 3 weeks before the Contractor intends to begin excavation.

Attention is directed to Section 7-1.01E, "Trench Safety."

#### **Replace Section 5-1.04 with:**

#### **5-1.04 CONTRACT COMPONENTS**

A component in one contract part applies as if appearing in each. The parts are complementary and describe and provide for a complete work.

If a discrepancy exists:

1. The governing ranking of contract parts in descending order is:
  - 1.1. Special provisions
  - 1.2. Project plans
  - 1.3. Revised Standard Plans
  - 1.4. Standard Plans
  - 1.5. Amendments to the Standard Specifications
  - 1.6. Standard Specifications
  - 1.7. Supplemental project information
2. Written numbers and notes on a drawing govern over graphics
3. A detail drawing governs over a general drawing
4. A detail specification governs over a general specification
5. A specification in a section governs over a specification referenced by that section

If a discrepancy is found or confusion arises, request correction or clarification.

#### **Add:**

#### **5-1.055 SUBCONTRACTING**

##### **5-1.055A General**

No subcontract releases you from the contract or relieves you of your responsibility for a subcontractor's work.

If you violate Pub Cont Code § 4100 et seq., the Department may exercise the remedies provided under Pub Cont Code § 4110. The Department may refer the violation to the Contractors State License Board as provided under Pub Cont Code § 4111.

Perform work equaling at least 30 percent of the value of the original total bid with your employees and with equipment owned or rented by you, with or without operators.

Each subcontract must comply with the contract.

Each subcontractor must have an active and valid State contractor's license with a classification appropriate for the work to be performed (Bus & Prof Code, § 7000 et seq.).

Submit copies of subcontracts upon request.

Before subcontracted work starts, submit a Subcontracting Request form.

Do not use a debarred contractor; a current list of debarred contractors is available at the Department of Industrial Relations' Web site.

Upon request, immediately remove and not again use a subcontractor who fails to prosecute the work satisfactorily.

**Replace Section 5-1.07 with:**

**5-1.07 LINES AND GRADES**

The Engineer places stakes and marks under Chapter 12, "Construction Surveys," of the Department's Surveys Manual.

Submit your request for Department-furnished stakes:

1. On a Request for Construction Stakes form. Ensure:
  - 1.1. Requested staking area is ready for stakes
  - 1.2. You use the stakes in a reasonable time
2. A reasonable time before starting an activity using the stakes

Establish priorities for stakes and note priorities on the request.

Preserve stakes and marks placed by the Engineer. If the stakes or marks are destroyed, the Engineer replaces them at the Engineer's earliest convenience and deducts the cost.

**Replace Section 5-1.116 with:**

**5-1.116 DIFFERING SITE CONDITIONS (23 CFR 635.109)**

**5-1.116A Contractor's Notification**

Promptly notify the Engineer if you find either of the following:

1. Physical conditions differing materially from either of the following:
  - 1.1. Contract documents
  - 1.2. Job site examination
2. Physical conditions of an unusual nature, differing materially from those ordinarily encountered and generally recognized as inherent in the work provided for in the contract

Include details explaining the information you relied on and the material differences you discovered.

If you fail to notify the Engineer promptly, you waive the differing site condition claim for the period between your discovery of the differing site condition and your notification to the Engineer.

If you disturb the site after discovery and before the Engineer's investigation, you waive the differing site condition claim.

**5-1.116B Engineer's Investigation and Decision**

Upon your notification, the Engineer investigates job site conditions and:

1. Notifies you whether to resume affected work
2. Decides whether the condition differs materially and is cause for an adjustment of time, payment, or both

**5-1.116C Protests**

You may protest the Engineer's decision by:

1. Submitting an Initial Notice of Potential Claim within 5 business days after receipt of the Engineer's notification
2. Complying with claim procedures

The Initial Notice of Potential Claim must detail the differences in your position from the Engineer's determination and support your position with additional information, including additional geotechnical data. Attach

to the Initial Notice of Potential Claim a certification stating that you complied with Section 2-1.11, "Job Site and Document Examination."

Promptly submit supplementary information when obtained.

**Replace Section 5-1.14 with:**

**5-1.14 COST REDUCTION INCENTIVE**

Comply with Section 4-1.035B, "Value Engineering Change Proposal."

**Add:**

**5-1.15 DISPUTE RESOLUTION**

**5-1.15A General**

Section 5-1.15, "Dispute Resolution," applies to a contract with 100 or more working days.

In the Dispute Resolution Advisor Agreement and in the Dispute Review Board Agreement, interpret a reference to the special provisions as a reference to the Amendments to the Standard Specifications. In the Dispute Review Board Agreement, replace "Proposal and Contract" with "Bid book." Where the section title does not match the section number for a reference, refer to the referenced title.

**5-1.15B Dispute Resolution Advisor**

Section 5-1.15B, "Dispute Resolution Advisor," applies to a contract from \$3 million to \$10 million.

A dispute resolution advisor, hereinafter referred to as "DRA", is chosen by the Department and the Contractor to assist in the resolution of disputes. The DRA is a part of the contract administrative claims process as specified in the provisions in Section 9-1.04, "Notice of Potential Claim," and Section 9-1.07B, "Final Payment and Claims," of the Standard Specifications. The DRA shall not serve as a substitute for filing a protest or a notice of potential claim.

The DRA shall be established by the Department and the Contractor within 30 days of contract approval.

The Department and the Contractor shall each propose 3 potential DRA candidates. Each potential candidate shall provide the Department and the Contractor with their disclosure statement. The disclosure statement shall include a resume of the potential candidate's experience and a declaration statement describing past, present, anticipated, and planned relationships with all parties involved in this contract.

The Department and the Contractor shall select one of the 6 nominees to be the DRA. If the Department and the Contractor cannot agree on one candidate, the Department and the Contractor shall each choose one of the 3 nominated by the other. The final selection of the DRA will be decided by a coin toss between the two candidates.

The Department and the Contractor shall complete and adhere to the Dispute Resolution Advisor Agreement. No DRA meeting shall take place until the Dispute Resolution Advisor Agreement has been signed by all parties, unless all parties agree to sign it at the first meeting.

If DRA needs outside technical services, technical services shall be preapproved by both the Department and the Contractor.

DRA recommendations are nonbinding.

The Contractor shall not use the DRA for disputes between subcontractors or suppliers that have no grounds for a lawsuit against the Department.

DRA replacement is selected in the same manner as the original selection. The appointment of a replacement DRA will begin promptly upon determination of the need for replacement. The Dispute Resolution Advisor Agreement shall be amended to reflect the change of the DRA.

Failure of the Contractor to participate in selecting DRA will result in the withhold of 25 percent of the estimated value of all work performed during each estimate period that the Contractor fails to comply. DRA withholds will be released for payment on the next monthly progress payment following the date that the Contractor has provided assistance in choosing the DRA and no interest will be due the Contractor.

The State and the Contractor shall bear the costs and expenses of the DRA equally.

The DRA shall be compensated at an agreed rate of \$1,500 per day for time spent per meeting either at the start of the project or for a dispute. A member serving on more than one State DRA or Dispute Review Board, regardless the number of meetings per day shall not be paid more than the agreed rate per day. The agreed rate shall be considered full compensation for on-site time, travel expenses, transportation, lodging, time for travel, and incidentals for each day or portion thereof that the DRA is at an authorized DRA meeting.

No additional compensation will be made for time spent by the DRA to review and research activities outside the official DRA meetings unless that time, such as time spent evaluating and preparing recommendations on specific issues presented to the DRA, has been specifically agreed to in advance by the State and Contractor. Time



away from the project that has been specifically agreed to in advance by the Department and the Contractor will be compensated at an agreed rate of \$150 per hour. The agreed amount of \$150 per hour shall include all incidentals including expenses for telephone, fax, and computer services.

The State will provide conference facilities for DRA meetings at no cost to the Contractor.

The Contractor shall make direct payments to the DRA for participation in authorized meetings and approved hourly rate charges from invoices submitted.

The State will reimburse the Contractor for the State's share of the costs.

There will be no markups applied to expenses associated with the DRA, either by the DRA or by the Contractor when requesting payment of the State's share of DRA expenses. Regardless of the DRA recommendation, neither party will be entitled to reimbursement of DRA costs from the other party.

The Contractor shall submit extra work bills and include invoices with original supporting documents for reimbursement of the State's share.

The cost of technical services will be borne equally by the State and Contractor. There will be no markups for these costs.

A copy of the "Dispute Resolution Advisor Agreement" to be executed by the Contractor, State and the DRA is as follows:

Form CEM 6206 Rev (04-06-07)

## **DISPUTE RESOLUTION ADVISOR AGREEMENT**

\_\_\_\_\_  
(Contract Identification)

Contract No. \_\_\_\_\_

**THIS DISPUTE RESOLUTION ADVISOR AGREEMENT, hereinafter called "AGREEMENT"**, made and entered into this \_\_\_\_\_ day of \_\_\_\_\_, \_\_\_\_\_, between the State of California, acting through the California Department of Transportation and the Director of Transportation, hereinafter called the "STATE," \_\_\_\_\_ hereinafter called the "CONTRACTOR," and \_\_\_\_\_, the Dispute Resolution Advisor, hereinafter called the "DRA." .

WITNESSETH, that

WHEREAS, the STATE and the CONTRACTOR, hereinafter called the "parties," are now engaged in the construction on the State Highway project referenced above; and

WHEREAS, the special provisions for the above referenced contract provides for the establishment and operation of the DRA to assist in resolving disputes; and

WHEREAS, the DRA is composed of one person, chosen by the CONTRACTOR and the STATE;

NOW THEREFORE, in consideration of the terms, conditions, covenants, and performance contained herein, or attached and incorporated and made a part hereof, the STATE, the CONTRACTOR, and the DRA hereto agree as follows:

### **SECTION I DESCRIPTION OF WORK**

To assist in the timely resolution of disputes between the parties, the contract provides for the establishment and the operation of the DRA. The DRA is to fairly and impartially consider disputes placed before it and provide recommendations for resolution of these disputes to the parties. The DRA shall provide recommendations based on the facts related to the dispute, the contract and applicable laws and regulations. The DRA shall perform the services necessary to participate in the DRA's actions as designated in Section III, Scope of Work.

### **SECTION II DRA QUALIFICATIONS**

DRA shall be knowledgeable in the type of construction and contract documents anticipated by the contract and shall have completed training through the Dispute Review Board Foundation. In addition, it is desirable for the DRA to have served on several State Dispute Review Boards (DRB).

No DRA shall have prior direct involvement in this contract. No DRA shall have a financial interest in this contract or parties thereto, including but not limited to the CONTRACTOR, subcontractors, suppliers, consultants,

and legal and business services, within a period 6 months prior to award and during this contract. Exceptions to above are compensation for services on this or other DRAs and DRBs or retirement payments or pensions received from a party that are not tied to, dependent on or affected by the net worth of the party.

DRA shall fully disclose all direct or indirect professional or personal relationships with all key members of the contract.

### **SECTION III SCOPE OF WORK**

The Scope of Work of the DRA includes, but is not limited to, the following:

#### **A. PROCEDURES**

The DRA shall meet with the parties at the start of the project to establish procedures that will govern the conduct of its business and reporting procedures in conformance with the requirements of the contract and the terms of this AGREEMENT. The DRA established procedures shall only be implemented upon approval by the parties. Subsequent meetings shall be held only to hear disputes between the parties.

The DRA shall not meet with, or discuss contract issues with individual parties.

State shall provide the DRA with the contract and all written correspondence regarding the dispute between the parties and, if available, the Contractor's supplemental notice of potential claim, and the Engineer's response to the supplemental notice of potential claim.

The parties shall not call the DRA who served on this contract as a witness in arbitration proceedings, which may arise from this contract.

The DRA shall have no claim against the STATE or the CONTRACTOR, or both, from claimed harm arising out of the parties' evaluations of the DRA's opinions.

#### **B. DISPUTE MEETING**

The term "dispute meeting" as used in this subsection shall refer to both the informal and traditional dispute meeting processes, unless otherwise noted.

If the CONTRACTOR requests a dispute meeting with the DRA, the Contractor must simultaneously notify the STATE. Upon being notified of the need for a dispute meeting, the DRA shall review and consider the dispute. The DRA shall determine the time and location of the dispute meeting with due consideration for the needs and preferences of the parties, while recognizing the importance of a speedy resolution to the dispute.

Dispute meetings shall be conducted at any location that would be convenient and provide required facilities and access to necessary documentation.

Only the STATE's Resident Engineer or Area Construction Engineer and the CONTRACTOR's or subcontractor's, if the dispute involves a subcontractor, Superintendent or Project Manager may present information at a dispute meeting. There shall be no participation of persons who are not directly involved in the contract or who do not have direct knowledge of the dispute. The exception to this is technical services, as described below:

The DRA, with approval of the parties, may obtain technical services necessary to adequately review the disputes presented, including audit, geotechnical, schedule analysis and other services. The parties' technical staff may supply those services as appropriate. The cost of technical services, as agreed to by the parties, shall be borne equally by the two parties as specified in an approved contract change order. The CONTRACTOR shall not be entitled to markups for the payments made for these services.

At the dispute meeting the DRA may ask questions, seek clarification, and request further clarification of data presented by either of the parties as may be necessary to assist in making a fully informed recommendation. However, the DRA shall refrain from expressing opinions on the merits of statements on matters under dispute during the parties' presentations. Each party will be given ample time to fully present its position, make rebuttals, provide relevant documents, and respond to DRA questions and requests.

There shall be no testimony under oath or cross-examination, during DRA dispute meetings. There shall be no reporting of the procedures by a shorthand reporter or by electronic means. Documents and verbal statements shall be received by the DRA in conformance with the rules and regulations established at the first meeting between the DRA and parties. These established rules and regulations need not comply with prescribed legal laws of evidence.

Failure to attend a dispute meeting by either of the parties shall be conclusively considered by the DRA as indication that the non-attending party considers all written documents and correspondence submitted as their entire and complete argument. The claimant shall discuss the dispute, followed by the other party. Each party shall then be allowed one or more rebuttals at the meeting until all aspects of the dispute are thoroughly covered.

## **1. TRADITIONAL DISPUTE MEETING:**

The following procedure shall be used for the traditional dispute meeting:

- a. Within 5 days, after receiving the STATE's written response to the CONTRACTOR's supplemental notice of potential claim, the CONTRACTOR shall refer the dispute to the DRA, if the CONTRACTOR wishes to further pursue the dispute. The CONTRACTOR shall make the referral in writing to the DRA, simultaneously copied to the STATE. The written dispute referral shall describe the disputed matter in individual discrete segments, so that it will be clear to both parties and the DRA what discrete elements of the dispute have been resolved, and which remain unresolved, and shall include an estimate of the cost of the affected work and impacts, if any, on project completion.
- b. The parties shall each be afforded an opportunity to be present and to be heard by the DRA, and to offer evidence. Either party furnishing written evidence or documentation to the DRA must furnish copies of such information to the other party a minimum of 10 days prior to the date the DRA is scheduled to convene the meeting for the dispute. Either party shall produce such additional evidence as the DRA may deem necessary to reach an understanding and a determination of the dispute. The party furnishing additional evidence shall furnish copies of such additional evidence to the other party at the same time the evidence is provided to the DRA. The DRA shall not consider evidence not furnished in conformance with the terms specified herein.
- c. Upon receipt by the DRA of a written referral of a dispute, the DRA shall convene to review and consider the dispute. The dispute meeting shall be held no later than 25 days after receipt of the written referral unless otherwise agreed to by all parties.
- d. The DRA shall furnish a written report to both parties. The DRA may request clarifying information of either party within 5 days after the DRA dispute meeting. Requested information shall be submitted to the DRA within 5 days of the DRA request. The DRA shall complete its report and submit it to the parties within 10 days of the DRA dispute meeting, except that time extensions may be granted at the request of the DRA with the written concurrence of both parties. The report shall summarize the facts considered, the contract language, law or regulation viewed by the DRA as pertinent to the dispute, and the DRA's interpretation and philosophy in arriving at its conclusions and recommendations and, if appropriate, recommends guidelines for determining compensation. The DRA's written opinion shall stand on its own, without attachments or appendices.
- e. Within 10 days after receiving the DRA's report, both parties shall respond to the DRA in writing signifying that the dispute is either resolved or remains unresolved. Failure to provide the written response within the time specified, or a written rejection of the DRA's recommendation or response to a request for reconsideration presented in the report by either party, shall conclusively indicate that the party(s) failing to respond accepts the DRA recommendation. Immediately after responses have been received from both parties, the DRA shall provide copies of both responses to the parties simultaneously. Either party may request clarification of elements of the DRA's report from the DRA prior to responding to the report. The DRA shall consider any clarification request only if submitted within 5 days of receipt of the DRA's report, and if submitted simultaneously in writing to both the DRA and the other party. Each party may submit only one request for clarification for any individual DRA report. The DRA shall respond, in writing, to requests for clarification within 5 days of receipt of such requests.
- f. Either party may seek a reconsideration of the DRA's recommendation. The DRA shall only grant reconsideration based upon submission of new evidence and if the request is submitted within the 10 day time limit specified for response to the DRA's written report. Each party may submit only one request for reconsideration regarding an individual DRA recommendation.
- g. If the parties are able to settle their dispute with the aid of the DRA's report, the STATE and CONTRACTOR shall promptly accept and implement the settlement of the parties. If the parties cannot agree on compensation within 30 days of the acceptance by both parties of the settlement, either party may request the DRA to make a recommendation regarding compensation.

## **2. INFORMAL DISPUTE MEETING**

An informal dispute meeting shall be convened, only if, the parties and the DRA agree that this dispute resolution process is appropriate to settle the dispute.

The following procedure shall be used for the informal dispute meeting:

- a. The parties shall furnish the DRA with one copy of pertinent documents requested by the DRA that are or may become necessary for the DRA to perform its function. The party furnishing documents shall furnish such documents to the other party at the same time the document is provided to the DRA.
- b. After the dispute meeting has concluded; the DRA shall deliberate in private the same day, until a response to the parties is reached or as otherwise agreed to by the parties.
- c. The DRA then verbally delivers its recommendation with findings to the parties.
- d. After the recommendation is presented, the parties may ask for clarifications.
- e. Occasionally the DRA on complex issues may be unable to formulate a recommendation based on the information given at a dispute meeting. However, the DRA may provide the parties with advice on strengths and weaknesses of their prospective positions, in the hope of the parties reaching settlement.
- f. If the parties are able to settle their dispute with the aid of the DRA's opinion, the STATE and CONTRACTOR shall promptly accept and implement the settlement of the parties.
- g. The DRA will not be bound by its oral recommendation in the event that a dispute is later heard by the DRA in a traditional dispute meeting.

Unless the dispute is settled, use of the informal dispute meeting does not relive the parties of their responsibilities under Section 5-1.12, "Dispute Resolution Advisor," of the Special Provisions or Subsection, "Traditional Dispute Meeting," of this AGREEMENT. There will be no extension of time allowed for the process to permit the use of the informal dispute meeting, unless otherwise agreed to by the parties.

#### **SECTION IV TIME FOR BEGINNING AND COMPLETION**

Once established, the DRA shall be in operation until the day the Director accepts the contract. The DRA shall not begin work under the terms of this AGREEMENT until authorized in writing by the STATE or as agreed to by the parties.

#### **SECTION V PAYMENT**

DRA shall be compensated at an agreed rate of \$1,500 per day for time spent per meeting, either at the start of the project or for a dispute. A member serving on more than one State DRA or DRB, regardless the number of meetings per day, shall not be paid more than the agreed rate per day. The agreed rate shall be considered full compensation for onsite time, travel expenses, transportation, lodging, time for travel and incidentals for each day, or portion thereof that the DRA is at an authorized DRA meeting. No additional compensation will be made for time spent by DRA to review and research activities outside the official DRA meetings unless that time, (such as time spent evaluating and preparing recommendations on specific issues presented to the DRA), has been specifically agreed to in advance by the parties. Time away from the project, which has been specifically agreed to in advance by the parties, will be compensated at an agreed rate of \$150 per hour. The agreed amount of \$150 per hour shall include all incidentals including expenses for telephone, fax, and computer services. The State will provide administrative services such as conference facilities to the DRA.

##### **A. PAYMENT PROCESSING**

CONTRACTOR shall make direct payments to DRA for their participation in authorized meetings and approved hourly rate charges, from invoices submitted by the DRA, and technical services.

DRA may submit invoices to the CONTRACTOR for partial payment for work performed and services rendered for their participation in authorized meetings not more often than once per month during the progress of the work. The invoices shall be in a format approved by the parties and accompanied by a general description of activities performed during that billing period. Payment for hourly fees, at the agreed rate, shall not be paid to a DRA until the amount and extent of those fees are approved by the STATE and CONTRACTOR.

##### **B. INSPECTION OF COSTS RECORDS**

DRA and the CONTRACTOR shall keep available for inspection by representatives of the STATE and the United States, for a period of 3 years after final payment, the cost records and accounts pertaining to this AGREEMENT. If any litigation, claim, or audit arising out of, in connection with, or related to this contract is initiated before the expiration of the 3-year period, the cost records and accounts shall be retained until such litigation, claim, or audit involving the records is completed.

#### **SECTION VI ASSIGNMENT OF TASKS OF WORK**

DRA shall not assign the work of this AGREEMENT.

## **SECTION VII TERMINATION OF A DRA MEMBER**

DRA may resign after providing not less than 15 days written notice of the resignation to the STATE and CONTRACTOR. The DRA may be terminated, by either party, for failing to fully comply at all times with all required employment or financial disclosure conditions of DRA membership in conformance with the terms of the contract and this AGREEMENT. Each party shall document the need for replacement and substantiate the replacement request in writing to the other party and the DRA.

## **SECTION VIII LEGAL RELATIONS**

The parties hereto mutually understand and agree that the DRA in the performance of duties is acting in the capacity of an independent agent and not as an employee of either party.

No party to this AGREEMENT shall bear a greater responsibility for damages or personal injury than is normally provided by Federal or State of California Law.

Notwithstanding the provisions of this contract that require the CONTRACTOR to indemnify and hold harmless the STATE, the parties shall jointly indemnify and hold harmless the DRA from and against all claims, damages, losses, and expenses, including but not limited to attorney's fees, arising out of and resulting from the findings and recommendations of the DRA.

## **SECTION IX CONFIDENTIALITY**

The parties hereto mutually understand and agree that all documents and records provided by the parties in reference to issues brought before the DRA, which documents and records are marked "Confidential - for use by the DRA only," shall be kept in confidence and used only for the purpose of resolution of subject disputes, and for assisting in development of DRA findings and recommendations; that such documents and records will not be utilized or revealed to others, except to officials of the parties who are authorized to act on the subject disputes, for any purposes, during the life of this AGREEMENT. Upon termination of this AGREEMENT, said confidential documents and records, and all copies thereof, shall be returned to the parties who furnished them to the DRA. However, the parties understand that such documents may be subsequently discoverable and admissible in court or arbitration proceedings unless a protective order has been obtained by the party seeking further confidentiality.

## **SECTION X DISPUTES**

Disputes between the parties arising out of the work or other terms of this AGREEMENT that cannot be resolved by negotiation and mutual concurrence between the parties or through the administrative process provided in the contract shall be resolved by arbitration as provided in Section 9-1.10, "Arbitration," of the Standard Specifications. Disputes between the DRA and the parties that cannot be resolved by negotiation and mutual concurrence shall be resolved in the appropriate forum.

## **SECTION XI VENUE, APPLICABLE LAW, AND PERSONAL JURISDICTION**

In the event that any party, including the DRA, deems it necessary to institute arbitration proceedings to enforce any right or obligation under this AGREEMENT, the parties hereto agree that such action shall be initiated in the Office of Administrative Hearings of the State of California. The parties hereto agree that all questions shall be resolved by arbitration by application of California law and that the parties to such arbitration shall have the right of appeal from such decisions to the Superior Court in conformance with the laws of the State of California. Venue for the arbitration shall be Sacramento or any other location as agreed to by the parties.

## **SECTION XII FEDERAL REVIEW AND REQUIREMENTS**

On Federal-Aid contracts, the Federal Highway Administration shall have the right to review the work of the DRA in progress, except for private meetings or deliberations of the DRA.

Other Federal requirements in this agreement shall only apply to Federal-Aid contracts.

### SECTION XIII CERTIFICATION OF CONTRACTOR, DRA, AND STATE

IN WITNESS WHEREOF, the parties hereto have executed this AGREEMENT as of the day and year first above written.

DRA

By: \_\_\_\_\_

Title: \_\_\_\_\_

CONTRACTOR

CALIFORNIA STATE DEPARTMENT  
OF TRANSPORTATION

By: \_\_\_\_\_

By: \_\_\_\_\_

Title: \_\_\_\_\_

Title: \_\_\_\_\_

#### 5-1.15C Dispute Review Board

- Section 5-1.15C, "Dispute Review Board," applies to a contract over \$10 million.

##### 5-1.15C(1) General

To assist in the resolution of disputes or potential claims arising out of the work of this project, a Dispute Review Board, hereinafter referred to as the "DRB," shall be established by the Engineer and Contractor cooperatively upon approval of the contract. The DRB is intended to assist the contract administrative claims resolution process as specified in the provisions in Section 9-1.04, "Notice of Potential Claim," and Section 9-1.07B, "Final Payment and Claims," of the Standard Specifications and these special provisions. The DRB shall not serve as a substitute for provisions in the specifications in regard to filing potential claims. The requirements and procedures established in this section shall be a prerequisite to filing a claim, filing for arbitration, or filing for litigation prior or subsequent to project completion.

The DRB shall be utilized when dispute or potential claim resolution at the project level is unsuccessful. The DRB shall function as specified herein until the day of acceptance of the contract, at which time the work of the DRB will cease except for completion of unfinished reports. No DRB dispute meetings shall take place later than 30 days prior to acceptance of contract. After acceptance of contract, disputes or potential claims which have followed the dispute resolution processes of the Standard Specifications and these special provisions, but have not been resolved, shall be stated or restated by the Contractor, in response to the Proposed Final Estimate within the time limits provided in Section 9-1.07B, "Final Payment and Claims," of the Standard Specifications. The State will review those claims in conformance with the provisions in Section 9-1.07B of the Standard Specifications. Following the adherence to and completion of the contractual administrative claims procedure, the Contractor may file for arbitration in conformance with the provisions in Section 9-1.10, "Arbitration," of the Standard Specifications and these special provisions.

Disputes, as used in this section, shall include differences of opinion, properly noticed as provided hereinafter, between the State and Contractor on matters related to the work and other subjects considered by the State or Contractor, or by both, to be of concern to the DRB on this project, except matters relating to Contractor, subcontractor or supplier potential claims not actionable against the Department as specified in these special provisions or quantification of disputes for overhead type expenses or costs. Disputes for overhead type expenses or costs shall conform to the requirements of Section 9-1.07B, "Final Payment and Claims," of the Standard Specifications. Whenever the term "dispute" or "disputes" is used herein, it shall be deemed to include potential claims as well as disputes.

The DRB shall serve as an advisory body to assist in the resolution of disputes between the State and the Contractor, hereinafter referred to as the "parties." The DRB shall consider disputes referred to it, and furnish written reports containing findings and recommendations pertaining to those disputes, to the parties to aid in resolution of the differences between them. DRB findings and recommendations are not binding on the parties.

##### 5-1.15C(2) Selection Process, Disclosure and Appointments

The DRB shall consist of one member selected by the State and approved by the Contractor, one member selected by the Contractor and approved by the State, and a third member selected by the first 2 members and approved by both the State and the Contractor. The third member shall act as the DRB Chairperson.

DRB members shall be especially knowledgeable in the type of construction and contract documents potentially anticipated by the contract. DRB members shall discharge their responsibilities impartially as an independent body, considering the facts and circumstances related to the matters under consideration, pertinent provisions of the contract and applicable laws and regulations.

The State and the Contractor shall nominate and approve DRB members in conformance with the terms and conditions of the Dispute Review Board Agreement and these special provisions, within 45 days of the approval of the contract. Each party shall provide written notification to the other of the name of their selected DRB nominee along with the prospective member's complete written disclosure statement.

Disclosure statements shall include a resume of the prospective member's experience and a declaration statement describing past, present, anticipated, and planned relationships, including indirect relationships through the prospective member's primary or full-time employer, to this project and with the parties involved in this construction contract, including but not limited to, relevant subcontractors or suppliers to the parties, parties' principals, or parties' counsel. DRB members shall also include a full disclosure of close professional or personal relationships with all key members of the contract. Objections to nominees must be based on a specific breach or violation of nominee responsibilities or on nominee qualifications under these provisions unless otherwise specified. The Contractor or the State may, on a one-time basis, object to the other's nominee without specifying a reason and this person will not be selected for the DRB. Another person shall then be nominated within 15 days.

The first duty of the State and Contractor selected members of the DRB shall be to select and recommend a prospective third DRB member to the parties for final selection and approval. The first 2 DRB members shall proceed with the selection of the third DRB member immediately upon receiving written notification from the State of their selection, and shall provide their recommendation simultaneously to the parties within 15 days of the notification.

The first 2 DRB members shall select a third DRB member subject to mutual approval of the parties or may mutually concur on a list of potentially acceptable third DRB members and submit the list to the parties for final selection and approval of the third member. The goal in the selection of the third member is to complement the professional experience of the first 2 members and to provide leadership for the DRB's activities.

The third prospective DRB member shall supply a full disclosure statement to the first 2 DRB members and to the parties prior to appointment.

An impasse shall be considered to have been reached if the parties are unable to approve a third member within 15 days of receipt of the recommendation of the first 2 DRB members, or if the first 2 DRB members are unable to agree upon a recommendation within their 15 day time limit. In the event of an impasse in selection of third DRB member the State and the Contractor shall each propose 3 candidates for the third DRB member position. The parties shall select the candidates proposed under this paragraph from the current list of arbitrators certified by the Public Works Contract Arbitration Committee created by Article 7.2 (commencing with Section 10245) of the State Contract Act. The first 2 DRB members shall then select one of the 6 proposed candidates in a blind draw.

No DRB member shall have prior direct involvement in this contract. No member shall have a financial interest in this contract or the parties thereto, within a period of 6 months prior to award of this contract or during the contract, except as follows:

- A. Compensation for services on this DRB.
- B. Ownership interest in a party or parties, documented by the prospective DRB member, that has been reviewed and determined in writing by the State to be sufficiently insignificant to render the prospective member acceptable to the State.
- C. Service as a member of other Dispute Review Boards on other contracts.
- D. Retirement payments or pensions received from a party that are not tied to, dependent on or affected by the net worth of the party.
- E. The above provisions apply to parties having a financial interest in this contract, including but not limited to contractors, subcontractors, suppliers, consultants, and legal and business services.

The Contractor or the State may reject any of the 3 DRB members who fail to fully comply at all times with all required employment and financial disclosure conditions of DRB membership as described in the Dispute Review Board Agreement and as specified herein. A copy of the Dispute Review Board Agreement is included in this section.

The Contractor, the State, and the 3 members of the DRB shall complete and adhere to the Dispute Review Board Agreement in administration of this DRB within 15 days of the parties' concurrence in the selection of the third member. No DRB meeting shall take place until the Dispute Review Board Agreement has been signed by all parties. The State authorizes the Engineer to execute and administer the terms of the Agreement. The person(s) designated by the Contractor as authorized to execute contract change orders shall be authorized to execute and

administer the terms of this agreement, or to delegate the authority in writing. The operation of the DRB shall be in conformance with the terms of the Dispute Review Board Agreement.

#### **5-1.15C(3) Compensation**

The State and the Contractor shall bear the costs and expenses of the DRB equally. Each DRB member shall be compensated at an agreed rate of \$1,200 per day if time spent per meeting, including on-site time plus one hour of travel time, is greater than 4 hours. Each DRB member shall be compensated at an agreed rate of \$700 per day if time spent per meeting, including on-site time plus one hour of travel time, is less than or equal to 4 hours. The agreed rates shall be considered full compensation for on-site time, travel expenses, transportation, lodging, time for travel and incidentals for each day, or portion thereof, that the DRB member is at an authorized DRB meeting. No additional compensation will be made for time spent by DRB members in review and research activities outside the official DRB meetings unless that time, (such as time spent evaluating and preparing recommendations on specific issues presented to the DRB), has been specifically agreed to in advance by the State and Contractor. Time away from the project, which has been specifically agreed to in advance by the parties, will be compensated at an agreed rate of \$125 per hour. The agreed amount of \$125 per hour shall include all incidentals including expenses for telephone, fax, and computer services. Members serving on more than one DRB involving the Department, regardless of the number of meetings per day, shall not be paid more than the all inclusive rate per day or rate per hour for an individual project. The State will provide, at no cost to the Contractor, administrative services such as conference facilities and secretarial services to the DRB. These special provisions and the Dispute Review Board Agreement state the provisions for compensation and expenses of the DRB. DRB members shall be compensated at the same daily and hourly rate. The Contractor shall make direct payments to each DRB member for their participation in authorized meetings and approved hourly rate charges from invoices submitted by each DRB member. The State will reimburse the Contractor for the State's share of the costs. There will be no markups applied to expenses connected with the DRB, either by the DRB members or by the Contractor when requesting payment of the State's share of DRB expenses. Regardless of the DRB recommendation, neither party shall be entitled to reimbursement of DRB costs from the other party.

#### **5-1.15C(4) Replacement of DRB Members**

Service of a DRB member may be terminated at any time with not less than 15 days notice as follows:

- A. The State may terminate service of the State appointed member.
- B. The Contractor may terminate service of the Contractor appointed member.
- C. Upon the written recommendation of the State and Contractor appointed members for the removal of the third member.
- D. Upon resignation of a member.
- E. The State or Contractor may terminate the service of any member who fails to fully comply with all required employment and financial disclosure conditions of DRB membership.

When a member of the DRB is replaced, the replacement member shall be appointed in the same manner as the replaced member was appointed. The appointment of a replacement DRB member will begin promptly upon determination of the need for replacement and shall be completed within 15 days. Changes in either of the DRB members chosen by the 2 parties will not require re-selection of the third member, unless both parties agree to such re-selection in writing. The Dispute Review Board Agreement shall be amended to reflect the change of a DRB member.

#### **5-1.15C(5) Operation**

The following procedure shall be used for dispute resolution:

- A. If the Contractor objects to any decision, act or order of the Engineer, the Contractor shall give written notice of potential claim in conformance with the provisions in Section 9-1.04, "Notice of Potential Claim," of the Standard Specifications and these special provisions, including the provision of applicable cost documentation; or file written protests or notices in conformance with the provisions in the Standard Specifications and these special provisions.
- B. The Engineer will respond, in writing, to the Contractor's written supplemental notice of potential claim within 20 days of receipt of the notice.
- C. Within 15 days after receipt of the Engineer's written response, the Contractor shall, if the Contractor still objects, file a written reply with the Engineer, stating clearly and in detail the basis of the objection.



- D. Following an objection to the Engineer's written response, the Contractor shall refer the dispute to the DRB if the Contractor wishes to further pursue the objection to the Engineer's decision. The Contractor shall make the referral in writing to the DRB, simultaneously copied to the State, within 21 days after receipt of the written response from the Engineer. The written dispute referral shall describe the disputed matter in individual discrete segments so that it will be clear to both parties and the DRB what discrete elements of the dispute have been resolved, and which remain unresolved, and shall include an estimate of the cost of the affected work and impacts, if any, on project completion.
- E. By failing to submit the written notice of referral to the DRB, within 21 days after receipt of the Engineer's written response to the supplemental notice of potential claim, the Contractor waives future claims and arbitration on the matter in contention.
- F. The Contractor and the State shall each be afforded an opportunity to be present and to be heard by the DRB, and to offer evidence. Either party furnishing written evidence or documentation to the DRB must furnish copies of such information to the other party a minimum of 15 days prior to the date the DRB is scheduled to convene the meeting for the dispute. Either party shall produce such additional evidence as the DRB may deem necessary to reach an understanding and a determination of the dispute. The party furnishing additional evidence shall furnish copies of such additional evidence to the other party at the same time the evidence is provided to the DRB. The DRB shall not consider evidence not furnished in conformance with the terms specified herein.
- G. Upon receipt by the DRB of a written referral of a dispute, the DRB shall convene to review and consider the dispute. The dispute meeting shall be held no earlier than 30 days and no later than 60 days after receipt of the written referral unless otherwise agreed to by all parties. The DRB shall determine the time and location of the DRB dispute meeting, with due consideration for the needs and preferences of the parties while recognizing the paramount importance of a timely hearing of the dispute.
- H. There shall be no participation of either party's attorneys at DRB dispute meetings.
- I. There shall be no participation of persons who are not directly involved in the contract or who do not have direct knowledge of the dispute, including but not limited to consultants, except for expert testimony allowed at the discretion of the DRB and with approval prior to the dispute meeting by both parties.
- J. The DRB shall furnish a report, containing findings and recommendations as described in the Dispute Review Board Agreement, in writing to both the State and the Contractor. The DRB may request clarifying information of either party within 10 days after the DRB dispute meeting. Requested information shall be submitted to the DRB within 10 days of the DRB request. The DRB shall complete its report, including minority opinion, if any, and submit it to the parties within 30 days of the DRB dispute meeting, except that time extensions may be granted at the request of the DRB with the written concurrence of both parties. The report shall include the facts and circumstances related to the matters under consideration, pertinent provisions of the contract, applicable laws and regulations, and actual costs and time incurred as shown on the Contractor's cost accounting records. The DRB shall make recommendations on the merit of the dispute and, if appropriate, recommend guidelines for determining compensation.
- K. Within 30 days after receiving the DRB's report, both the State and the Contractor shall respond to the DRB in writing signifying that the dispute is either resolved or remains unresolved. Failure to provide the written response within the time specified, or a written rejection of the DRB's recommendation or response to a request for reconsideration presented in the report by either party, shall conclusively indicate that the party(s) failing to respond accepts the DRB recommendation. Immediately after responses have been received from both parties, the DRB shall provide copies of both responses to the parties simultaneously. Either party may request clarification of elements of the DRB's report from the DRB prior to responding to the report. The DRB shall consider any clarification request only if submitted within 10 days of receipt of the DRB's report, and if submitted simultaneously in writing to both the DRB and the other party. Each party may submit only one request for clarification for any individual DRB report. The DRB shall respond, in writing, to requests for clarification within 10 days of receipt of such requests.
- L. The DRB's recommendations, stated in the DRB's reports, are not binding on either party. Either party may seek a reconsideration of a recommendation of the DRB. The DRB shall only grant a reconsideration based upon submission of new evidence and if the request is submitted within the 30-day time limit specified for response to the DRB's written report. Each party may submit only one request for reconsideration regarding an individual DRB recommendation.
- M. If the State and the Contractor are able to resolve their dispute with the aid of the DRB's report, the State and Contractor shall promptly accept and implement the recommendations of the DRB. If the parties cannot agree on compensation within 60 days of the acceptance by both parties of the DRB's recommendation, either party may request the DRB to make a recommendation regarding compensation.
- N. The State or the Contractor shall not call DRB members who served on the DRB for this contract as witnesses in arbitration proceedings which may arise from this contract, and all documents created by the

DRB shall be inadmissible as evidence in subsequent arbitration proceedings, except the DRB's final written reports on each issue brought before it.

- O. The State and Contractor shall jointly indemnify and hold harmless the DRB members from and against all claims, damages, losses, and expenses, including but not limited to attorney's fees, arising out of and resulting from the findings and recommendations of the DRB.
- P. The DRB members shall have no claim against the State or the Contractor, or both, from claimed harm arising out of the parties' evaluations of the DRB's report.

#### **5-1.15C(6) Disputes Involving Subcontractor Potential Claims**

For purposes of this section, a "subcontractor potential claim" shall include any potential claim by a subcontractor (including also any pass through potential claims by a lower tier subcontractor or supplier) against the Contractor that is actionable by the Contractor against the Department which arises from the work, services, or materials provided or to be provided in connection with the contract. If the Contractor determines to pursue a dispute against the Department that includes a subcontractor potential claim, the dispute shall be processed and resolved in conformance with these special provisions and in conformance with the following:

- A. The Contractor shall identify clearly in submissions pursuant to this section, that portion of the dispute that involves a subcontractor potential claim or potential claims.
- B. The Contractor shall include, as part of its submission pursuant to Step D above, a certification (False Claims Act Certification) by the subcontractor's or supplier's officer, partner, or authorized representative with authority to bind the subcontractor and with direct knowledge of the facts underlying the subcontractor potential claim. The Contractor shall submit a certification that the subcontractor potential claim is acknowledged and forwarded by the Contractor. The form for these certifications is available from the Engineer.
- C. At DRB dispute meetings involving one or more subcontractor potential claims, the Contractor shall require that each subcontractor involved in the dispute have present an authorized representative with actual knowledge of the facts underlying the subcontractor potential claim to assist in presenting the subcontractor potential claim and to answer questions raised by the DRB members or the Department's representatives.
- D. Failure by the Contractor to declare a subcontractor potential claim on behalf of its subcontractor (including lower tier subcontractors' and suppliers' pass through potential claims) at the time of submission of the Contractor's potential claims, as provided hereunder, shall constitute a release of the State by the Contractor of such subcontractor potential claim.
- E. The Contractor shall include in all subcontracts under this contract that subcontractors and suppliers of any tier (a) agree to submit subcontractor potential claims to the Contractor in a proper form and in sufficient time to allow processing by the Contractor in conformance with the Dispute Review Board resolution specifications; (b) agree to be bound by the terms of the Dispute Review Board provisions to the extent applicable to subcontractor potential claims; (c) agree that, to the extent a subcontractor potential claim is involved, completion of all steps required under these Dispute Review Board special provisions shall be a condition precedent to pursuit by the subcontractor of other remedies permitted by law, including without limitation of a lawsuit against the Contractor; and (d) agree that the existence of a dispute resolution process for disputes involving subcontractor potential claims shall not be deemed to create any claim, right, or cause of action by any subcontractor or supplier against the Department.

Notwithstanding the foregoing, this Dispute Review Board special provision shall not apply to, and the DRB shall not have the authority to consider, subcontractor potential claims between the subcontractor(s) or supplier(s) and the Contractor that are not actionable by the Contractor against the Department.

#### **5-1.15C(7) Dispute Review Board Agreement**

A copy of the "Dispute Review Board Agreement" to be executed by the Contractor, State and the 3 DRB members after approval of the contract follows:

## DISPUTE REVIEW BOARD AGREEMENT

\_\_\_\_\_  
(Contract Identification)

Contract No. \_\_\_\_\_

**THIS DISPUTE REVIEW BOARD AGREEMENT, hereinafter called "AGREEMENT",** made and entered into this \_\_\_\_\_ day of \_\_\_\_\_, \_\_\_\_\_, between the State of California, acting through the California Department of Transportation and the Director of Transportation, hereinafter called the "STATE," \_\_\_\_\_ hereinafter called the "CONTRACTOR," and the Dispute Review Board, hereinafter called the "DRB" consisting of the following members:

\_\_\_\_\_,  
(Contractor Appointee)

\_\_\_\_\_,  
(State Appointee)

and \_\_\_\_\_  
(Third Person)

WITNESSETH, that

WHEREAS, the STATE and the CONTRACTOR, hereinafter called the "parties," are now engaged in the construction on the State Highway project referenced above; and

WHEREAS, the special provisions for the above referenced contract provides for the establishment and operation of the DRB to assist in resolving disputes; and

WHEREAS, the DRB is composed of three members, one selected by the STATE, one selected by the CONTRACTOR, and the third member selected by the other two members and approved by the parties;

NOW THEREFORE, in consideration of the terms, conditions, covenants, and performance contained herein, or attached and incorporated and made a part hereof, the STATE, the CONTRACTOR, and the DRB members hereto agree as follows:

### SECTION I DESCRIPTION OF WORK

To assist in the resolution of disputes between the parties, the contract provides for the establishment and the operation of the DRB. The intent of the DRB is to fairly and impartially consider disputes placed before it and provide written recommendations for resolution of these disputes to both parties. The members of this DRB shall perform the services necessary to participate in the DRB's actions as designated in Section II, Scope of Work.

### SECTION II SCOPE OF WORK

The scope of work of the DRB includes, but is not limited to, the following:

#### A. OBJECTIVE

The principal objective of the DRB is to assist in the timely resolution of disputes between the parties arising from performance of this contract. It is not intended for either party to default on their normal responsibility to amicably and fairly settle their differences by indiscriminately assigning them to the DRB. It is intended that the mere existence of the DRB will encourage the parties to resolve disputes without resorting to this review procedure. But when a dispute that is serious enough to warrant the DRB's review does develop, the process for prompt and efficient action will be in place.

## **B. PROCEDURES**

The DRB shall render written reports on disputes between the parties arising from the construction contract. Prior to consideration of a dispute, the DRB shall establish rules and regulations that will govern the conduct of its business and reporting procedures in conformance with the requirements of the contract and the terms of this AGREEMENT. DRB recommendations, resulting from its consideration of a dispute, shall be furnished in writing to both parties. The recommendations shall be based on facts and circumstances involved in the dispute, pertinent contract provisions, applicable laws and regulations. The recommendations shall find one responsible party in a dispute; shared or "jury" determinations shall not be rendered. The DRB shall make recommendations on the merit of the dispute, and if appropriate, recommend guidelines for determining compensation. If the parties cannot agree on compensation within 60 days of the acceptance by both parties of the DRB's recommendation, either party may request the DRB to make a recommendation regarding compensation.

The DRB shall refrain from officially giving advice or consulting services to anyone involved in the contract. The individual members shall act in a completely independent manner and while serving as members of the DRB shall have no consulting business connections with either party or its principals or attorneys or other affiliates (subcontractors, suppliers, etc.) who have a beneficial interest in the contract.

During scheduled meetings of the DRB as well as during dispute meetings, DRB members shall refrain from expressing opinions on the merits of statements on matters under dispute or potential dispute. Opinions of DRB members expressed in private sessions shall be kept strictly confidential. Individual DRB members shall not meet with, or discuss contract issues with individual parties, except as directed by the DRB Chairperson. Such discussions or meetings shall be disclosed to both parties. Other discussions regarding the project between the DRB members and the parties shall be in the presence of all three members and both parties. Individual DRB members shall not undertake independent investigations of any kind pertaining to disputes or potential disputes, except with the knowledge of both parties and as expressly directed by the DRB Chairperson.

## **C. CONSTRUCTION SITE VISITS, PROGRESS MEETINGS AND FIELD INSPECTIONS**

The DRB members shall visit the project site and meet with representatives of the parties to keep abreast of construction activities and to develop familiarity with the work in progress. Scheduled progress meetings shall be held at or near the project site. The DRB shall meet at least once at the start of the project, and at least once every 4 months thereafter. The frequency, exact time, and duration of additional site visits and progress meetings shall be as recommended by the DRB and approved by the parties consistent with the construction activities or matters under consideration and dispute. Each meeting shall consist of a round table discussion and a field inspection of the work being performed on the contract, if necessary. Each meeting shall be attended by representatives of both parties. The agenda shall generally be as follows:

1. Meeting opened by the DRB Chairperson.
2. Remarks by the STATE's representative.
3. A description by the CONTRACTOR's representative of work accomplished since the last meeting; the current schedule status of the work; and a forecast for the coming period.
4. An outline by the CONTRACTOR's representative of potential problems and a description of proposed solutions.
5. An outline by the STATE's representative of the status of the work as the STATE views it.
6. A brief description by the CONTRACTOR's or STATE's representative of potential claims or disputes which have surfaced since the last meeting.
7. A summary by the STATE's representative, the CONTRACTOR's representative, or the DRB of the status of past disputes and potential claims.

The STATE's representative will prepare minutes of all progress meetings and circulate them for revision and approval by all concerned within 10 days of the meeting.

The field inspection shall cover all active segments of the work, the DRB being accompanied by both parties' representatives. The field inspection may be waived upon mutual agreement of the parties.

## **D. DRB CONSIDERATION AND HANDLING OF DISPUTES**

Upon receipt by the DRB of a written referral of a dispute, the DRB shall convene to review and consider the dispute. The dispute meeting shall be held no earlier than 30 days and no later than 60 days after receipt of the written referral, unless otherwise agreed to by all parties. The DRB shall determine the time and location of DRB dispute meetings, with due consideration for the needs and preferences of the parties while recognizing the paramount importance of speedy resolution of issues. No dispute meetings shall take place later than 30 days prior to acceptance of contract.

Normally, dispute meetings shall be conducted at or near the project site. However, any location that would be more convenient and still provide required facilities and access to necessary documentation shall be satisfactory.

Both parties shall be given the opportunity to present their evidence at these dispute meetings. It is expressly understood that the DRB members are to act impartially and independently in the consideration of the contract provisions, applicable laws and regulations, and the facts and conditions surrounding any dispute presented by either party, and that the recommendations concerning any such dispute are advisory and nonbinding on the parties.

The DRB may request that written documentation and arguments from both parties be sent to each DRB member, through the DRB Chairperson, for review before the dispute meeting begins. A party furnishing written documentation to the DRB shall furnish copies of such information to the other party at the same time that such information is supplied to the DRB.

DRB dispute meetings shall be informal. There shall be no testimony under oath or cross-examination. There shall be no reporting of the procedures by a shorthand reporter or by electronic means. Documents and verbal statements shall be received by the DRB in conformance with acceptance standards established by the DRB. These standards need not comply with prescribed legal laws of evidence.

The third DRB member shall act as Chairperson for dispute meetings and all other DRB activities. The parties shall have a representative at all dispute meetings. Failure to attend a duly noticed dispute meeting by either of the parties shall be conclusively considered by the DRB as indication that the non-attending party considers written submittals as their entire and complete argument. The claimant shall discuss the dispute, followed by the other party. Each party shall then be allowed one or more rebuttals until all aspects of the dispute are thoroughly covered. DRB members shall ask questions, seek clarification, and request further data from either of the parties as may be necessary to assist in making a fully informed recommendation. The DRB may request from either party documents or information that would assist the DRB in making its findings and recommendations including, but not limited to, documents used by the CONTRACTOR in preparing the bid for the project. A refusal by a party to provide information requested by the DRB may be considered by the DRB as an indication that the requested material would tend to disprove that party's position. In large or complex cases, additional dispute meetings may be necessary in order to consider all the evidence presented by both parties. All involved parties shall maintain the confidentiality of all documents and information, as provided in this AGREEMENT.

During dispute meetings, no DRB member shall express an opinion concerning the merit of any facet of the case. DRB deliberations shall be conducted in private, with interim individual views kept strictly confidential.

After dispute meetings are concluded, the DRB shall meet in private and reach a conclusion supported by 2 or more members. Private sessions of the DRB may be held at a location other than the job site or by electronic conferencing as deemed appropriate, in order to expedite the process.

The DRB's findings and recommendations, along with discussion of reasons therefor, shall then be submitted as a written report to both parties. Recommendations shall be based on the pertinent contract provisions, applicable laws and regulations, and facts and circumstances related to the dispute. The report shall be thorough in discussing the facts considered, the contract language, law or regulation viewed by the DRB as pertinent to the issues, and the DRB's interpretation and philosophy in arriving at its conclusions and recommendations. The DRB's report shall stand on its own, without attachments or appendices. The DRB Chairperson shall furnish a copy of the written recommendation report to the DRB Coordinator, Division of Construction, MS 44, P.O. Box 942874, Sacramento, CA 94274.

With prior written approval of both parties, the DRB may obtain technical services necessary to adequately review the disputes presented, including audit, geotechnical, schedule analysis and other services. The parties' technical staff may supply those services as appropriate. The cost of technical services, as agreed to by the parties, shall be borne equally by the 2 parties as specified in an approved contract change order. The CONTRACTOR will not be entitled to markups for the payments made for these services.

The DRB shall resist submittal of incremental portions of information by either party, in the interest of making a fully informed decision and recommendation.

The DRB shall make every effort to reach a unanimous decision. If this proves impossible, the dissenting member shall prepare a minority opinion, which shall be included in the DRB's report.

Although both parties should place weight upon the DRB's recommendations, they are not binding. Either party may appeal a recommendation to the DRB for reconsideration. However, reconsideration shall only be allowed when there is new evidence to present, and the DRB shall accept only one appeal from each party pertaining to an individual DRB recommendation. The DRB shall hear appeals in conformance with the terms described in the Section entitled "Dispute Review Board" in the special provisions.

#### **E. DRB MEMBER REPLACEMENT**

Should the need arise to appoint a replacement DRB member, the replacement DRB member shall be appointed in the same manner as the original DRB members were appointed. The selection of a replacement DRB member

shall begin promptly upon notification of the necessity for a replacement and shall be completed within 15 days. This AGREEMENT shall be amended to indicate change in DRB membership.

### **SECTION III CONTRACTOR RESPONSIBILITIES**

The CONTRACTOR shall furnish to each DRB member one copy of pertinent documents that are or may become necessary for the DRB to perform their function. Pertinent documents are written notices of potential claim, responses to those notices, drawings or sketches, calculations, procedures, schedules, estimates, or other documents which are used in the performance of the work or in justifying or substantiating the CONTRACTOR's position. The CONTRACTOR shall also furnish a copy of such pertinent documents to the STATE, in conformance with the terms outlined in the special provisions.

### **SECTION IV STATE RESPONSIBILITIES**

The STATE will furnish the following services and items:

#### **A. CONTRACT RELATED DOCUMENTS**

The STATE will furnish to each DRB member one copy of Notice to Contractors and Special Provisions, Proposal and Contract, Plans, Standard Specifications, and Standard Plans, change orders, written instructions issued by the STATE to the CONTRACTOR, or other documents pertinent to any dispute that has been referred to the DRB and necessary for the DRB to perform its function.

#### **B. COORDINATION AND SERVICES**

The STATE, through the Engineer, will, in cooperation with the CONTRACTOR, coordinate the operations of the DRB. The Engineer will arrange or provide conference facilities at or near the project site and provide secretarial and copying services to the DRB without charge to the CONTRACTOR.

### **SECTION V TIME FOR BEGINNING AND COMPLETION**

Once established, the DRB shall be in operation until the day of acceptance of the contract. The DRB members shall not begin work under the terms of this AGREEMENT until authorized in writing by the STATE.

### **SECTION VI PAYMENT**

#### **A. ALL INCLUSIVE RATE PAYMENT**

The STATE and the CONTRACTOR shall bear the costs and expenses of the DRB equally. Each DRB member shall be compensated at an agreed rate of \$1,200 per day if time spent per meeting, including on-site time plus one hour of travel time, is greater than 4 hours. Each DRB member shall be compensated at an agreed rate of \$700 per day if time spent per meeting, including on-site time plus one hour of travel time, is less than or equal to 4 hours. The agreed rates shall be considered full compensation for on-site time, travel expenses, transportation, lodging, time for travel and incidentals for each day, or portion thereof, that the DRB member is at an authorized DRB meeting. No additional compensation will be made for time spent by DRB members in review and research activities outside the official DRB meetings unless that time has been specifically agreed to in advance by the STATE and CONTRACTOR. Time away from the project that has been specifically agreed to in advance by the parties will be compensated at an agreed rate of \$125 per hour. The agreed amount of \$125 per hour shall include all incidentals including expenses for telephone, fax, and computer services. Members serving on more than one DRB involving the State, regardless of the number of meetings per day, shall not be paid more than the all inclusive rate per day or rate per hour for an individual project. The STATE will provide, at no cost to the CONTRACTOR, administrative services such as conference facilities and secretarial services to the DRB.

#### **B. PAYMENTS**

DRB members shall be compensated at the same rate. The CONTRACTOR shall make direct payments to each DRB member for their participation in authorized meetings and approved hourly rate charges from invoices submitted by each DRB member. The STATE will reimburse the CONTRACTOR for its share of the costs of the DRB.

The DRB members may submit invoices to the CONTRACTOR for partial payment for work performed and services rendered for their participation in authorized meetings not more often than once per month during the progress of the work. The invoices shall be in a format approved by the parties and accompanied by a general description of activities performed during that billing period. Payment for hourly fees, at the agreed rate, shall not

be paid to a DRB member until the amount and extent of those fees are approved by the STATE and CONTRACTOR.

Invoices shall be accompanied by original supporting documents, which the CONTRACTOR shall include with the extra work billing when submitting for reimbursement of the STATE's share of cost from the STATE. The CONTRACTOR will be reimbursed for one-half of approved costs of the DRB. No markups will be added to the CONTRACTOR's payment.

### **C. INSPECTION OF COSTS RECORDS**

The DRB members and the CONTRACTOR shall keep available for inspection by representatives of the STATE and the United States, for a period of 3 years after final payment, the cost records and accounts pertaining to this AGREEMENT. If any litigation, claim, or audit arising out of, in connection with, or related to this contract is initiated before the expiration of the 3-year period, the cost records and accounts shall be retained until such litigation, claim, or audit involving the records is completed.

### **SECTION VII ASSIGNMENT OF TASKS OF WORK**

The DRB members shall not assign the work of this AGREEMENT.

### **SECTION VIII TERMINATION OF DRB MEMBERS**

DRB members may resign from the DRB by providing not less than 15 days written notice of the resignation to the STATE and CONTRACTOR. DRB members may be terminated by their original appointing power or by either party, for failing to fully comply at all times with all required employment and financial disclosure conditions of DRB membership in conformance with the terms of the contract.

### **SECTION IX LEGAL RELATIONS**

The parties hereto mutually understand and agree that the DRB member in the performance of duties on the DRB, is acting in the capacity of an independent agent and not as an employee of either party.

No party to this AGREEMENT shall bear a greater responsibility for damages or personal injury than is normally provided by Federal or State of California Law.

Notwithstanding the provisions of this contract that require the CONTRACTOR to indemnify and hold harmless the STATE, the parties shall jointly indemnify and hold harmless the DRB members from and against all claims, damages, losses, and expenses, including but not limited to attorney's fees, arising out of and resulting from the findings and recommendations of the DRB.

### **SECTION X CONFIDENTIALITY**

The parties hereto mutually understand and agree that all documents and records provided by the parties in reference to issues brought before the DRB, which documents and records are marked "Confidential - for use by the DRB only," shall be kept in confidence and used only for the purpose of resolution of subject disputes, and for assisting in development of DRB findings and recommendations; that such documents and records will not be utilized or revealed to others, except to officials of the parties who are authorized to act on the subject disputes, for any purposes, during the life of the DRB. Upon termination of this AGREEMENT, said confidential documents and records, and all copies thereof, shall be returned to the parties who furnished them to the DRB. However, the parties understand that such documents shall be subsequently discoverable and admissible in court or arbitration proceedings unless a protective order has been obtained by the party seeking further confidentiality.

### **SECTION XI DISPUTES**

Disputes between the parties hereto, including disputes between the DRB members and either party or both parties, arising out of the work or other terms of this AGREEMENT, which cannot be resolved by negotiation and mutual concurrence between the parties, or through the administrative process provided in the contract, shall be resolved by arbitration as provided in Section 9-1.10, "Arbitration," of the Standard Specifications.

### **SECTION XII VENUE, APPLICABLE LAW, AND PERSONAL JURISDICTION**

In the event that any party, including an individual member of the DRB, deems it necessary to institute arbitration proceedings to enforce any right or obligation under this AGREEMENT, the parties hereto agree that such action shall be initiated in the Office of Administrative Hearings of the State of California. The parties hereto agree that all questions shall be resolved by arbitration by application of California law and that the parties to such arbitration shall have the right of appeal from such decisions to the Superior Court in conformance with the laws of

the State of California. Venue for the arbitration shall be Sacramento or any other location as agreed to by the parties.

### **SECTION XIII FEDERAL REVIEW AND REQUIREMENTS**

On Federal-Aid contracts, the Federal Highway Administration shall have the right to review the work of the DRB in progress, except for private meetings or deliberations of the DRB.

Other Federal requirements in this agreement shall only apply to Federal-Aid contracts.

### **SECTION XIV CERTIFICATION OF THE CONTRACTOR, THE DRB MEMBERS, AND THE STATE**

IN WITNESS WHEREOF, the parties hereto have executed this AGREEMENT as of the day and year first above written.

DRB MEMBER

DRB MEMBER

By: \_\_\_\_\_

By: \_\_\_\_\_

Title: \_\_\_\_\_

Title : \_\_\_\_\_

DRB MEMBER

By : \_\_\_\_\_

Title : \_\_\_\_\_

CONTRACTOR

CALIFORNIA STATE DEPARTMENT  
OF TRANSPORTATION

By: \_\_\_\_\_

By: \_\_\_\_\_

Title: \_\_\_\_\_

Title: \_\_\_\_\_

**Add:**

**5-1.16–5-17 (BLANK)**

**Add:**

### **5-1.18 PROPERTY AND FACILITY PRESERVATION**

#### **5-1.18A General**

Preserve property and facilities, including:

1. Adjacent property
2. Department's instrumentation
3. ESAs
4. Lands administered by other agencies
5. Railroads and railroad equipment
6. Roadside vegetation not to be removed
7. Utilities
8. Waterways

Immediately report damage to the Engineer.

If you cause damage, you are responsible.

Install sheet piling, cribbing, bulkheads, shores, or other supports necessary to support existing facilities or support material carrying the facilities.

Dispose of temporary facilities when they are no longer needed.



If you damage plants not to be removed:

1. Dispose of them outside the right of way unless the Engineer allows you to reduce them to chips and spread the chips within the highway at locations designated by the Engineer
2. Replace them

Replace plants with plants of the same species.

Replace trees with 600 mm-box trees.

Replace shrubs with No. 15 container shrubs.

Replace ground cover plants with plants from flats. Replace Carpobrotus ground cover plants with plants from cuttings. Plant ground cover plants 300 mm on center.

If a plant establishment period is specified, replace plants before the start of the plant establishment period; otherwise, replace plants at least 30 days before Contract acceptance.

Water each plant immediately after planting and saturate the backfill soil around and below the roots or ball of earth around the roots of each plant. Water as necessary to maintain plants in a healthy condition until Contract acceptance.

The Department may make a temporary repair to restore service to a damaged facility.

If working on or adjacent to railroad property, do not interfere with railroad operations.

For an excavation on or affecting railroad property, submit work plans showing the system to be used to protect railroad facilities. Allow 65 days for the Engineer's review of the plans. Do not perform work based on the plans until the Engineer notifies you they are accepted.

Full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in protecting or repairing property as specified in this section is included in the prices paid for the various contract items of work and no additional compensation will be allowed.

#### **5-1.18B Nonhighway Facilities (Including Utilities)**

The Department may rearrange a nonhighway facility during the Contract. Rearrangement of a nonhighway facility includes installation, relocation, alteration, or removal of the facility. The Department may authorize facility owners and their agents to enter the highway to perform rearrangement work for their facilities or to make connections or repairs to their property. Coordinate activities to avoid delays.

Notify the Engineer at least 3 business days before you contact the regional notification center under Govt Code § 4216 et seq. Failure to contact the notification center prohibits excavation.

Before starting work that could damage or interfere with underground infrastructure, locate the infrastructure described in the Contract, including laterals and other appurtenances, and determine the presence of other underground infrastructure inferred from visible facilities such as buildings, meters, or junction boxes.

Notify the Engineer if the infrastructure described in the Contract cannot be found. If after giving the notice, you find the infrastructure in a substantially different location than described, finding the infrastructure is paid for as extra work as specified in Section 4-1.03D, "Extra Work."

Underground infrastructure described in the Contract may be in different locations than described, and additional infrastructure may exist.

Upon discovering an underground main or trunk line not described in the Contract, immediately notify the Engineer and the infrastructure owner. The Engineer orders the locating and protecting of the infrastructure. The locating and protecting is paid for as extra work as specified in Section 4-1.03D, "Extra Work." If ordered, repair infrastructure damage. If the damage is not due to your negligence, the repair is paid for as extra work as specified in Section 4-1.03D, "Extra Work."

If necessary underground infrastructure rearrangement is not described in the Contract, the Engineer may order you to perform the work. The rearrangement is paid for as extra work as specified in Section 4-1.03D, "Extra Work."

If you want infrastructure rearrangement different from that described in the Contract:

1. Notify the Engineer
2. Make an arrangement with the infrastructure owner
3. Obtain authorization for the rearrangement
4. The Department does not adjust time or payment for rearrangement different from the Contract
5. Pay the infrastructure owner any additional cost

Immediately notify the Engineer of a delay due to the presence of main line underground infrastructure not described in the Contract or in a substantially different location or due to rearrangement different from the Contract.

The Department pays for one of these delays in the same manner as specified for a right of way delay in Section 8-1.09, "Right of Way Delays."

AA

## SECTION 6 CONTROL OF MATERIALS

**(Issued 07-01-08)**

**Replace Section 6-1.05 with:**

### 6-1.05 Specific Brand or Trade Name and Substitution

A reference to a specific brand or trade name establishes a quality standard and is not intended to limit competition. You may use a product that is equal to or better than the specified brand or trade name if approved.

Submit a substitution request within a time period that:

1. Follows Contract award
2. Allows 30 days for review
3. Causes no delay

Include substantiating data with the substitution request that proves the substitution:

1. Is of equal or better quality and suitability
2. Causes no delay in product delivery and installation

**Add:**

### 6-1.075 GUARANTEE

Guarantee the work remains free from substantial defects for 1 year after contract acceptance except for work parts for which you were relieved of maintenance and protection. Guarantee each of these relieved work parts for 1 year after the relief date.

The guarantee excludes damage or displacement caused by an event outside your control including:

1. Normal wear and tear
2. Improper operation
3. Insufficient maintenance
4. Abuse
5. Unauthorized change
6. Act of God

During the guarantee period, repair or replace each work portion having a substantial defect.

The Department does not pay for corrective work.

During corrective work activities, provide insurance coverage specified for coverage before contract acceptance.

The contract bonds must be in full force and effect until the later of:

1. Expiration of guarantee period
2. Completion of corrective work

If a warranty specification conflicts with Section 6-1.075, "Guarantee," comply with the warranty specification.

During the guarantee period, the Engineer monitors the completed work. If the Engineer finds work having a substantial defect, the Engineer lists work parts and furnishes you the list.

Within 10 days of receipt of the list, submit for authorization a detailed plan for correcting the work. Include a schedule that includes:

1. Start and completion dates
2. List of labor, equipment, materials, and any special services you plan to use

3. Work related to the corrective work, including traffic control and temporary and permanent pavement markings

The Engineer notifies you when the plan is authorized. Start corrective work and related work within 15 days of notice.

If the Engineer determines corrective work is urgently required to prevent injury or property damage:

1. The Engineer furnishes you a request to start emergency repair work and a list of parts requiring corrective work
2. Mobilize within 24 hours and start work
3. Submit a corrective work plan within 5 days of starting emergency repair work

If you fail to perform work as specified, the Department may perform the work and bill you.

**Add:**

**6-1.085 BUY AMERICA (23 CFR 635.410)**

For a Federal-aid contract, furnish steel and iron materials to be incorporated into the work that are produced in the United States except:

1. Foreign pig iron and processed, pelletized, and reduced iron ore may be used in the domestic production of the steel and iron materials [60 Fed Reg 15478 (03/24/1995)]
2. If the total combined cost of the materials does not exceed the greater of 0.1 percent of the total bid or \$2 500, material produced outside the United States may be used

Production includes:

1. Processing steel and iron materials, including smelting or other processes that alter the physical form or shape (such as rolling, extruding, machining, bending, grinding, and drilling) or chemical composition
2. Coating application, including epoxy coating, galvanizing, and painting, that protects or enhances the value of steel and iron materials

For steel and iron materials to be incorporated into the work, submit a Certificate of Compliance under Section 6-1.07, "Certificates of Compliance," of the Standard Specifications that certifies all production processes occurred in the United States except for the above exceptions.

**Add:**

**6-1.087 BUY AMERICA (PUB RES CODE § 42703(d))**

Furnish crumb rubber to be incorporated into the work that is produced in the United States and is derived from waste tires taken from vehicles owned and operated in the United States.

For crumb rubber to be incorporated into the work, submit a Certificate of Compliance under Section 6-1.07, "Certificates of Compliance," of the Standard Specifications that certifies only crumb rubber manufactured in the United States and derived from waste tires taken from vehicles owned and operated in the United States is used.

**In Section 6-2.01 delete the 4th paragraph.**

**In Section 6-2.01 replace the 7th paragraph with:**

Upon the Contractor's written request, the Department tests materials from an untested local source. If satisfactory material from that source is used in the work, the Department does not charge the Contractor for the tests; otherwise, the Department deducts the test cost.

**In Section 6-2.01 delete the 8th paragraph.**

**In Section 6-2.02 delete the 3rd paragraph.**

**In Section 6-2.02 in the 7th paragraph, replace the 2nd sentence with:**

The Department deducts the charges for the removed material.

**In Section 6-3.01 delete the 4th paragraph.**

**In Section 6-3.01 in the 6th paragraph, delete the 1st sentence.**

**In Section 6-3.01 add:**

As used in Section 6-3.01, "Testing," tests are tests to assure the quality and to determine the acceptability of the work.

The Department deducts costs of testing work found to be noncompliant.

[illegible]

## SECTION 7 LEGAL RELATIONS AND RESPONSIBILITY

**(Issued 09-25-09)**

**Replace Section 7-1.01 with:**

### 7-1.01 LAWS TO BE OBSERVED

Comply with laws, regulations, orders, decrees, and PLACs applicable to the project. Indemnify and defend the State against any claim or liability arising from the violation of a law, regulation, order, decree, or PLAC by you or your employees. Immediately report to the Engineer in writing a discrepancy or inconsistency between the contract and a law, regulation, order, decree, or PLAC.

**In Section 7-1.01A replace the 1st clause with:**

Work on the job site must comply with Labor Code §§ 1727 and 1770-1815 and 8 CA Code of Regs § 16000 et seq. Work includes roadside production and processing of materials.

**In Section 7-1.01A(2) in the 1st paragraph, replace item 3 with:**

3. Upon becoming aware of the subcontractor's failure to pay the specified prevailing rate of wages to the subcontractor's workers, the Contractor must diligently take corrective action to stop or rectify the failure, including withholding sufficient funds due the subcontractor for work performed on the public works project.

**In Section 7-1.01A(2) replace the 2nd paragraph with:**

Pursuant to Section 1775 of the Labor Code, the Division of Labor Standards Enforcement must notify the Contractor on a public works project within 15 days of the receipt by the Division of Labor Standards Enforcement of a complaint of the failure of a subcontractor on that public works project to pay workers the general prevailing rate of per diem wages. If the Division of Labor Standards Enforcement determines that employees of a subcontractor were not paid the general prevailing rate of per diem wages and if the Department did not withhold sufficient money under the contract to pay those employees the balance of wages owed under the general prevailing rate of per diem wages, the Contractor must withhold an amount of moneys due the subcontractor sufficient to pay those employees the general prevailing rate of per diem wages if requested by the Division of Labor Standards Enforcement. The Contractor must pay any money withheld from and owed to a subcontractor upon receipt of

notification by the Division of Labor Standards Enforcement that the wage complaint has been resolved. If notice of the resolution of the wage complaint has not been received by the Contractor within 180 days of the filing of a valid notice of completion or acceptance of the public works project, whichever occurs later, the Contractor must pay all moneys withheld from the subcontractor to the Department. The Department withholds these moneys pending the final decision of an enforcement action.

**In Section 7-1.01A(2) replace the 7th paragraph with:**

Changes in general prevailing wage determinations apply to the contract when the Director of Industrial Relations has issued them at least 10 days before advertisement (Labor Code § 1773.6 and 8 CA Code of Regs 16204).

**In Section 7-1.01A(3) replace the 2nd paragraph with:**

The Department withholds the penalties specified in subdivision (g) of Labor Code § 1776 for noncompliance with the requirements in Section 1776.

**In Section 7-1.01A(3) replace the 4th paragraph with:**

The Department withholds for delinquent or inadequate payroll records (Labor Code § 1771.5). If the Contractor has not submitted an adequate payroll record by the month's 15th day for the period ending on or before the 1st of that month, the Department withholds 10 percent of the monthly progress estimate, exclusive of mobilization. The Department does not withhold more than \$10 000 or less than \$1000.

**In Section 7-1.01A(3) delete the 5th paragraph.**

**Replace Section 7-1.01A(6) with:**

**7-1.01A(6) (Blank)**

**Add:**

**7-1.01K Solid Waste Disposal and Recycling**

Submit an annual Solid Waste Disposal and Recycling Report between January 1 and 15 for each year work is performed under the Contract at any time during the previous calendar year. Show the types and amounts of project-generated solid waste taken to or diverted from landfills or reused on the project from January 1 through December 31 of the previous calendar year.

Submit a final annual Solid Waste Disposal and Recycling Report within 5 business days after Contract acceptance. Show the types and amounts of project-generated solid waste taken to or diverted from landfills or reused on the project from January 1 to contract acceptance.

For each failure to submit a completed form, the Department withholds \$10,000.

**Add:**

**7-1.01L Asbestos and Hazardous Substances**

- Upon discovery, immediately stop working in and notify the Engineer of areas where asbestos or a hazardous substance is present if the:

1. Contractor reasonably believes the substance is asbestos as defined in Labor Code § 6501.7 or a hazardous substance as defined in Health & Safety Code §§ 25316 and 25317
2. Presence is not described in the contract
3. Substance has not been made harmless

**Add:**

**7-1.01M Archaeological Discoveries**

If archaeological materials are discovered at the job site, protect and leave them undisturbed in place and comply with:

1. Pub Res Code §§ 5097.5, 5097.98, and 5097.99
2. 14 CA Code of Regs § 4308
4. Penal Code § 622-1/2
5. Health & Safety Code § 7050.5

Archaeological materials are the remains of past human activity including historic-period archaeological materials and prehistoric Native American archaeological materials. Nonhuman fossils are not archaeological materials unless they show direct evidence of human use or alteration or when found in direct physical association with archaeological materials

Historic-period archaeological materials include cultural remains beginning with initial European contact in California but at least 50 years old and include:

1. Trash deposits or clearly defined disposal pits containing tin cans, bottles, ceramic dishes, or other refuse indicating previous occupation or use of the site
2. Structural remains of stone, brick, concrete, wood, or other building material found above or below ground
3. Human skeletal remains from the historic period, with or without coffins or caskets, including any associated grave goods

Prehistoric Native American archaeological materials include:

1. Human skeletal remains or associated burial goods such as beads or ornaments
2. Evidence of tool making or hunting such as arrowheads and associated chipping debris of fine-grained materials such as obsidian, chert, or basalt
3. Evidence of plant processing such as pestles, grinding slabs, or stone bowls
4. Evidence of habitation such as cooking pits, stone hearths, packed or burnt earth floors
5. Remains from food processing such as concentrations of discarded or burnt animal bone, shellfish remains, or burnt rocks used in cooking

Immediately upon discovering archaeological materials, stop all work within an 18.5-meter radius of the archaeological materials and notify the Engineer. Archaeological materials discovered are the property of the State. Do not resume work within the 18.5-meter radius of the discovery until the Engineer gives you written approval. If, in the opinion of the Engineer, completion of the work is delayed or interfered with by reason of an archaeological discovery or investigation or recovery of archaeological materials, you will be compensated for resulting losses and an extension of time will be granted in the same manner as provided for in Section 8-1.09, "Right of Way Delays," of the Standard Specifications.

The Department may use other forces to investigate and recover archaeological materials from the location of the discovery. If ordered by the Engineer furnish labor, material, tools, and equipment to secure the location of the discovery and assist in the investigation or recovery of archaeological materials; the cost of this work will be paid for as extra work as specified in Section 4-1.03D, "Extra Work," of the Standard Specifications.

**In Section 7-1.02 in the 2nd paragraph, replace the 4th sentence with:**

Trucks used to haul treated base, portland cement concrete, or hot mix asphalt shall enter onto the base to dump at the nearest practical entry point ahead of spreading equipment.

**In Section 7-1.02 between the 4th and 5th paragraphs, add:**

Loads imposed on existing, new, or partially completed structures shall not exceed the load carrying capacity of the structure or any portion of the structure as determined by AASHTO LRFD with interims and California Amendments, Design Strength Limit State II. The compressive strength of concrete ( $f'_c$ ) to be used in computing the load carrying capacity shall be the smaller of the following:

1. Actual compressive strength at the time of loading

2. Value of  $f'_c$  shown on the plans for that portion of the structure or 2.5 times the value of  $f'_c$  (extreme fiber compressive stress in concrete at service loads) shown on the plans for portions of the structure where no  $f'_c$  is shown

**In Section 7-1.06 in the 1st paragraph, add:**

The Contractor's Injury and Illness Prevention Program shall be submitted to the Engineer. The program shall address the use of personal and company issued electronic devices during work. The use of entertainment and personal communication devices in the work zone shall not be allowed. Workers may use a communication device for business purposes in the work area, at a location where their safety and the safety of other workers and the traveling public is not compromised.

**In Section 7-1.09 replace the 8th paragraph with:**

Signs, lights, flags, and other warning and safety devices and their use shall conform to the requirements set forth in Part 6 of the California MUTCD except where a discrepancy exists between the California MUTCD and the specifications; for discrepancies, comply with the specifications. Signs or other protective devices furnished and erected by the Contractor, at the Contractor's expense, as above provided, shall not obscure the visibility of, nor conflict in intent, meaning and function of either existing signs, lights and traffic control devices or any construction area signs and traffic control devices for which furnishing of, or payment for, is provided elsewhere in the specifications. Signs furnished and erected by the Contractor, at the Contractor's expense, shall be approved by the Engineer as to size, wording and location.

**In Section 7-1.09 replace the 14th paragraph with:**

The Contractor shall notify the Engineer not less than 18 days and no more than 90 days prior to the anticipated start of an operation that will change the vertical or horizontal clearance available to public traffic (including shoulders).

**In Section 7-1.09 replace the 16th paragraph with:**

When vertical clearance is temporarily reduced to 4.72 m or less, low clearance warning signs shall be placed in accordance with Part 2 of the California MUTCD and as directed by the Engineer. Signs shall conform to the dimensions, color, and legend requirements of the California MUTCD and these specifications except that the signs shall have black letters and numbers on an orange retroreflective background. W12-2P signs shall be illuminated so that the signs are clearly visible.

**Add to Section 7-1.09:**

The Contractor shall install temporary railing (Type K) between a lane open to public traffic and an excavation, obstacle or storage area when the following conditions exist:

- A. Excavations-The near edge of the excavation is 3.6 m or less from the edge of the lane, except:
  1. Excavations covered with sheet steel or concrete covers of adequate thickness to prevent accidental entry by traffic or the public.
  2. Excavations less than 0.3 m deep.
  3. Trenches less than 0.3 m wide for irrigation pipe or electrical conduit, or excavations less than 0.3 m in diameter.
  4. Excavations parallel to the lane for the purpose of pavement widening or reconstruction.
  5. Excavations in side slopes, where the slope is steeper than 4:1 (horizontal:vertical).
  6. Excavations protected by existing barrier or railing.
- B. Temporarily Unprotected Permanent Obstacles-The work includes the installation of a fixed obstacle together with a protective system, such as a sign structure together with protective railing, and the Contractor elects to install the obstacle prior to installing the protective system; or the Contractor, for the Contractor's convenience and with permission of the Engineer, removes a portion of an existing protective railing at an obstacle and does not replace such railing complete in place during the same day.

- C. Storage Areas-Material or equipment is stored within 3.6 m of the lane and the storage is not otherwise prohibited by the provisions of the Standard Specifications and these special provisions.

The approach end of temporary railing (Type K), installed in conformance with the provisions in this section "Public Safety" and in Section 7-1.09, "Public Safety," of the Standard Specifications, shall be offset a minimum of 4.6 m from the edge of the traffic lane open to public traffic. The temporary railing shall be installed on a skew toward the edge of the traffic lane of not more than 0.3 m transversely to 3 m longitudinally with respect to the edge of the traffic lane. If the 4.6 m minimum offset cannot be achieved, the temporary railing shall be installed on the 10 to 1 skew to obtain the maximum available offset between the approach end of the railing and the edge of the traffic lane, and an array of temporary crash cushion modules shall be installed at the approach end of the temporary railing.

Temporary railing (Type K) shall be secured in place before starting work for which the temporary railing is required.

Except for installing, maintaining and removing traffic control devices, whenever work is performed or equipment is operated in the following work areas, the Contractor shall close the adjacent traffic lane unless otherwise provided in the Standard Specifications and these special provisions:

Approach Speed of Public Traffic (Posted Limit) (Kilometers Per Hour)	Work Areas
Over 72 (45 Miles Per Hour)	Within 1.8 m of a traffic lane but not on a traffic lane
56 to 72 (35 to 45 Miles Per Hour)	Within 0.9 m of a traffic lane but not on a traffic lane

The lane closure provisions of this section shall not apply if the work area is protected by permanent or temporary railing or barrier.

When traffic cones or delineators are used to delineate a temporary edge of a traffic lane, the line of cones or delineators shall be considered to be the edge of the traffic lane, however, the Contractor shall not reduce the width of an existing lane to less than 3 m without written approval from the Engineer.

When work is not in progress on a trench or other excavation that required closure of an adjacent lane, the traffic cones or portable delineators used for the lane closure shall be placed off of and adjacent to the edge of the traveled way. The spacing of the cones or delineators shall be not more than the spacing used for the lane closure.

Suspended loads or equipment shall not be moved nor positioned over public traffic or pedestrians.

**Replace Section 7-1.11 with:**

**7-1.11 PRESERVATION OF PROPERTY**

Comply with Section 5-1.18, "Property and Facility Preservation."

**Replace Section 7-1.12 with:**

**7-1.12 INDEMNIFICATION AND INSURANCE**

The Contractor's obligations regarding indemnification of the State of California and the requirements for insurance shall conform to the provisions in Section 3-1.05, "Insurance Policies," and Sections 7-1.12A, "Indemnification," and 7-1.12B, "Insurance," of this Section 7-1.12.

**7-1.12A Indemnification**

The Contractor shall defend, indemnify, and save harmless the State, including its officers, employees, and agents (excluding agents who are design professionals) from any and all claims, demands, causes of action, damages, costs, expenses, actual attorneys' fees, losses or liabilities, in law or in equity (Section 7-1.12A Claims) arising out of or in connection with the Contractor's performance of this contract for:

1. Bodily injury including, but not limited to, bodily injury, sickness or disease, emotional injury or death to persons, including, but not limited to, the public, any employees or agents of the Contractor, the State, or any other contractor; and
2. Damage to property of anyone including loss of use thereof; caused or alleged to be caused in whole or in part by any negligent or otherwise legally actionable act or omission of the Contractor or anyone directly or indirectly employed by the Contractor or anyone for whose acts the Contractor may be liable.



Except as otherwise provided by law, these requirements apply regardless of the existence or degree of fault of the State. The Contractor is not obligated to indemnify the State for Claims arising from conduct delineated in Civil Code Section 2782 and to Claims arising from any defective or substandard condition of the highway that existed at or before the start of work, unless this condition has been changed by the work or the scope of the work requires the Contractor to maintain existing highway facilities and the Claim arises from the Contractor's failure to maintain. The Contractor's defense and indemnity obligation shall extend to Claims arising after the work is completed and accepted if the Claims are directly related to alleged acts or omissions by the Contractor that occurred during the course of the work. State inspection is not a waiver of full compliance with these requirements.

The Contractor's obligation to defend and indemnify shall not be excused because of the Contractor's inability to evaluate liability or because the Contractor evaluates liability and determine that the Contractor is not liable. The Contractor shall respond within 30 days to the tender of any Claim for defense and indemnity by the State, unless this time has been extended by the State. If the Contractor fails to accept or reject a tender of defense and indemnity within 30 days, in addition to any other remedy authorized by law, the Department may withhold such funds the State reasonably considers necessary for its defense and indemnity until disposition has been made of the Claim or until the Contractor accepts or rejects the tender of defense, whichever occurs first.

With respect to third-party claims against the Contractor, the Contractor waives all rights of any type to express or implied indemnity against the State, its officers, employees, or agents (excluding agents who are design professionals).

Nothing in the Contract is intended to establish a standard of care owed to any member of the public or to extend to the public the status of a third-party beneficiary for any of these indemnification specifications.

#### **7-1.12B Insurance**

##### **7-1.12B(1) General**

Nothing in the contract is intended to establish a standard of care owed to any member of the public or to extend to the public the status of a third-party beneficiary for any of these insurance specifications.

##### **7-1.12B(2) Casualty Insurance**

The Contractor shall procure and maintain insurance on all of its operations with companies acceptable to the State as follows:

1. The Contractor shall keep all insurance in full force and effect from the beginning of the work through contract acceptance.
2. All insurance shall be with an insurance company with a rating from A.M. Best Financial Strength Rating of A- or better and a Financial Size Category of VII or better.
3. The Contractor shall maintain completed operations coverage with a carrier acceptable to the State through the expiration of the patent deficiency in construction statute of repose set forth in Code of Civil Procedure Section 337.15.

##### **7-1.12B(3) Workers' Compensation and Employer's Liability Insurance**

In accordance with Labor Code Section 1860, the Contractor shall secure the payment of worker's compensation in accordance with Labor Code Section 3700.

In accordance with Labor Code Section 1861, the Contractor shall submit to the Department the following certification before performing the work:

I am aware of the provisions of Section 3700 of the Labor Code which require every employer to be insured against liability for workers' compensation or to undertake self-insurance in accordance with the provisions of that code, and I will comply with such provisions before commencing the performance of the work of this contract.

Contract execution constitutes certification submittal.

The Contractor shall provide Employer's Liability Insurance in amounts not less than:

1. \$1 000 000 for each accident for bodily injury by accident
2. \$1 000 000 policy limit for bodily injury by disease
3. \$1 000 000 for each employee for bodily injury by disease

If there is an exposure of injury to the Contractor's employees under the U.S. Longshoremen's and Harbor Workers' Compensation Act, the Jones Act, or under laws, regulations, or statutes applicable to maritime employees, coverage shall be included for such injuries or claims.

#### **7-1.12B(4) Liability Insurance**

##### **7-1.12B(4)(a) General**

The Contractor shall carry General Liability and Umbrella or Excess Liability Insurance covering all operations by or on behalf of the Contractor providing insurance for bodily injury liability and property damage liability for the following limits and including coverage for:

1. Premises, operations, and mobile equipment
2. Products and completed operations
3. Broad form property damage (including completed operations)
4. Explosion, collapse, and underground hazards
5. Personal injury
6. Contractual liability

##### **7-1.12B(4)(b) Liability Limits/Additional Insureds**

The limits of liability shall be at least the amounts shown in the following table:

Total Bid	For Each Occurrence <sup>1</sup>	Aggregate for Products/Completed Operation	General Aggregate <sup>2</sup>	Umbrella or Excess Liability <sup>3</sup>
≤\$1 000 000	\$1 000 000	\$2 000 000	\$2 000 000	\$5 000 000
>\$1 000 000 ≤\$10 000 000	\$1 000 000	\$2 000 000	\$2 000 000	\$10 000 000
>\$10 000 000 ≤\$25 000 000	\$2 000 000	\$2 000 000	\$4 000 000	\$15 000 000
>\$25 000 000	\$2 000 000	\$2 000 000	\$4 000 000	\$25 000 000
<ol style="list-style-type: none"> <li>1. Combined single limit for bodily injury and property damage.</li> <li>2. This limit shall apply separately to the Contractor's work under this contract.</li> <li>3. The umbrella or excess policy shall contain a clause stating that it takes effect (drops down) in the event the primary limits are impaired or exhausted.</li> </ol>				

The Contractor shall not require certified Small Business subcontractors to carry Liability Insurance that exceeds the limits in the table above. Notwithstanding the limits specified herein, at the option of the Contractor, the liability insurance limits for certified Small Business subcontractors of any tier may be less than those limits specified in the table. For Small Business subcontracts, "Total Bid" shall be interpreted as the amount of subcontracted work to a certified Small Business.

The State, including its officers, directors, agents (excluding agents who are design professionals), and employees, shall be named as additional insureds under the General Liability and Umbrella Liability Policies with respect to liability arising out of or connected with work or operations performed by or on behalf of the Contractor under this contract. Coverage for such additional insureds does not extend to liability:

1. Arising from any defective or substandard condition of the roadway which existed at or before the time the Contractor started work, unless such condition has been changed by the work or the scope of the work requires the Contractor to maintain existing roadway facilities and the claim arises from the Contractor's failure to maintain;
2. For claims occurring after the work is completed and accepted unless these claims are directly related to alleged acts or omissions of the Contractor that occurred during the course of the work; or
3. To the extent prohibited by Insurance Code Section 11580.04

Additional insured coverage shall be provided by a policy provision or by an endorsement providing coverage at least as broad as Additional Insured (Form B) endorsement form CG 2010, as published by the Insurance Services Office (ISO), or other form designated by the Department.

#### **7-1.12B(4)(c) Contractor's Insurance Policy is Primary**

The policy shall stipulate that the insurance afforded the additional insureds applies as primary insurance. Any other insurance or self-insurance maintained by the State is excess only and shall not be called upon to contribute with this insurance.

#### **7-1.12B(5) Automobile Liability Insurance**

The Contractor shall carry automobile liability insurance, including coverage for all owned, hired, and nonowned automobiles. The primary limits of liability shall be not less than \$1 000 000 combined single limit each accident for bodily injury and property damage. The umbrella or excess liability coverage required under Section 7-1.12B(4)(b) also applies to automobile liability.

#### **7-1.12B(6) Policy Forms, Endorsements, and Certificates**

The Contractor shall provide its General Liability Insurance under Commercial General Liability policy form No. CG0001 as published by the Insurance Services Office (ISO) or under a policy form at least as broad as policy form No. CG0001.

#### **7-1.12B(7) Deductibles**

The State may expressly allow deductible clauses, which it does not consider excessive, overly broad, or harmful to the interests of the State. Regardless of the allowance of exclusions or deductions by the State, the Contractor is responsible for any deductible amount and shall warrant that the coverage provided to the State is in accordance with Section 7-1.12B, "Insurance."

#### **7-1.12B(8) Enforcement**

The Department may assure the Contractor's compliance with its insurance obligations. Ten days before an insurance policy lapses or is canceled during the contract period, the Contractor shall submit to the Department evidence of renewal or replacement of the policy.

If the Contractor fails to maintain any required insurance coverage, the Department may maintain this coverage and withhold or charge the expense to the Contractor or terminate the Contractor's control of the work in accordance with Section 8-1.08, "Termination of Control."

The Contractor is not relieved of its duties and responsibilities to indemnify, defend, and hold harmless the State, its officers, agents, and employees by the Department's acceptance of insurance policies and certificates.

Minimum insurance coverage amounts do not relieve the Contractor for liability in excess of such coverage, nor do they preclude the State from taking other actions available to it, including the withholding of funds under this contract.

#### **7-1.12B(9) Self-Insurance**

Self-insurance programs and self-insured retentions in insurance policies are subject to separate annual review and approval by the State.

If the Contractor uses a self-insurance program or self-insured retention, the Contractor shall provide the State with the same protection from liability and defense of suits as would be afforded by first-dollar insurance. Execution of the contract is the Contractor's acknowledgement that the Contractor will be bound by all laws as if the Contractor were an insurer as defined under Insurance Code Section 23 and that the self-insurance program or self-insured retention shall operate as insurance as defined under Insurance Code Section 22.

**In Section 7-1.13 delete the 5th and 6th paragraphs.**

**Add:**

### **7-1.50 FEDERAL LAWS FOR FEDERAL-AID CONTRACTS**

#### **7-1.50A General**

Section 7-1.50, "Federal Laws for Federal-Aid Contracts," includes specifications required in a Federal-aid construction contract and applies to a Federal-aid contract.

Form FHWA-1273 is included in the contract in Section 7-1.50B, "FHWA-1273." Some contract terms on the form are different than those used in other contract parts as shown in the following table:

### FHWA-1273 Terms and Department Equivalencies

FHWA-1273 Term	Equivalent Term Used in Other Contract Parts
SHA	Department
SHA contracting officer	Engineer
SHA resident engineer	Engineer

#### 7-1.50B FHWA-1273

FHWA-1273 Electronic version -- March 10, 1994  
with revised Section VI

### REQUIRED CONTRACT PROVISIONS FEDERAL-AID CONSTRUCTION CONTRACTS

- I. General
- II. Nondiscrimination
- III. Nonsegregated Facilities
- IV. Payment of Predetermined Minimum Wage
- V. Statements and Payrolls
- VI. Record of Materials, Supplies, and Labor
- VII. Subletting or Assigning the Contract
- VIII. Safety: Accident Prevention
- IX. False Statements Concerning Highway Projects
- X. Implementation of Clean Air Act and Federal Water Pollution Control Act
- XI. Certification Regarding Debarment, Suspension, Ineligibility, and Voluntary Exclusion
- XII. Certification Regarding Use of Contract Funds for Lobbying

### ATTACHMENTS

- A. Employment Preference for Appalachian Contracts (included in Appalachian contracts only)

#### I. GENERAL

1. These contract provisions shall apply to all work performed on the contract by the contractor's own organization and with the assistance of workers under the contractor's immediate superintendence and to all work performed on the contract by piecework, station work, or by subcontract.
2. Except as otherwise provided for in each section, the contractor shall insert in each subcontract all of the stipulations contained in these Required Contract Provisions, and further require their inclusion in any lower tier subcontract or purchase order that may in turn be made. The Required Contract Provisions shall not be incorporated by reference in any case. The prime contractor shall be responsible for compliance by any subcontractor or lower tier subcontractor with these Required Contract Provisions.
3. A breach of any of the stipulations contained in these Required Contract Provisions shall be sufficient grounds for termination of the contract.
4. A breach of the following clauses of the Required Contract Provisions may also be grounds for debarment as provided in 29 CFR 5.12:

Section I, paragraph 2;  
Section IV, paragraphs 1, 2, 3, 4, and 7;  
Section V, paragraphs 1 and 2a through 2g.

5. Disputes arising out of the labor standards provisions of Section IV (except paragraph 5) and Section V of these Required Contract Provisions shall not be subject to the general disputes clause of this contract. Such disputes shall be resolved in accordance with the procedures of the U.S. Department of Labor (DOL) as set forth in 29 CFR 5, 6, and 7. Disputes within the meaning of this clause include disputes between the contractor (or any of its subcontractors) and the contracting agency, the DOL, or the contractor's employees or their representatives.
6. **Selection of Labor:** During the performance of this contract, the contractor shall not:
  - a. discriminate against labor from any other State, possession, or territory of the United States (except for employment preference for Appalachian contracts, when applicable, as specified in Attachment A), or
  - b. employ convict labor for any purpose within the limits of the project unless it is labor performed by convicts who are on parole, supervised release, or probation.

## II. NONDISCRIMINATION

(Applicable to all Federal-aid construction contracts and to all related subcontracts of \$10,000 or more.)

1. **Equal Employment Opportunity:** Equal employment opportunity (EEO) requirements not to discriminate and to take affirmative action to assure equal opportunity as set forth under laws, executive orders, rules, regulations (28 CFR 35, 29 CFR 1630 and 41 CFR 60) and orders of the Secretary of Labor as modified by the provisions prescribed herein, and imposed pursuant to 23 U.S.C. 140 shall constitute the EEO and specific affirmative action standards for the contractor's project activities under this contract. The Equal Opportunity Construction Contract Specifications set forth under 41 CFR 60-4.3 and the provisions of the American Disabilities Act of 1990 (42 U.S.C. 12101 *et seq.*) set forth under 28 CFR 35 and 29 CFR 1630 are incorporated by reference in this contract. In the execution of this contract, the contractor agrees to comply with the following minimum specific requirement activities of EEO:
  - a. The contractor will work with the State highway agency (SHA) and the Federal Government in carrying out EEO obligations and in their review of his/her activities under the contract.
  - b. The contractor will accept as his operating policy the following statement:

"It is the policy of this Company to assure that applicants are employed, and that employees are treated during employment, without regard to their race, religion, sex, color, national origin, age or disability. Such action shall include: employment, upgrading, demotion, or transfer; recruitment or recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship, preapprenticeship, and/or on-the-job training."
2. **EEO Officer:** The contractor will designate and make known to the SHA contracting officers an EEO Officer who will have the responsibility for and must be capable of effectively administering and promoting an active contractor program of EEO and who must be assigned adequate authority and responsibility to do so.
3. **Dissemination of Policy:** All members of the contractor's staff who are authorized to hire, supervise, promote, and discharge employees, or who recommend such action, or who are substantially involved in such action, will be made fully cognizant of, and will implement, the contractor's EEO policy and contractual responsibilities to provide EEO in each grade and classification of employment. To ensure that the above agreement will be met, the following actions will be taken as a minimum:
  - a. Periodic meetings of supervisory and personnel office employees will be conducted before the start of work and then not less often than once every six months, at which time the contractor's EEO policy and its implementation will be reviewed and explained. The meetings will be conducted by the EEO Officer.
  - b. All new supervisory or personnel office employees will be given a thorough indoctrination by the EEO Officer, covering all major aspects of the contractor's EEO obligations within thirty days following their reporting for duty with the contractor.
  - c. All personnel who are engaged in direct recruitment for the project will be instructed by the EEO Officer in the contractor's procedures for locating and hiring minority group employees.
  - d. Notices and posters setting forth the contractor's EEO policy will be placed in areas readily accessible to employees, applicants for employment and potential employees.
  - e. The contractor's EEO policy and the procedures to implement such policy will be brought to the attention of employees by means of meetings, employee handbooks, or other appropriate means.
4. **Recruitment:** When advertising for employees, the contractor will include in all advertisements for employees the notation: "An Equal Opportunity Employer." All such advertisements will be placed in publications having a large circulation among minority groups in the area from which the project work force would normally be derived.
  - a. The contractor will, unless precluded by a valid bargaining agreement, conduct systematic and direct recruitment through public and private employee referral sources likely to yield qualified minority group applicants. To meet this requirement, the contractor will identify sources of potential minority group employees, and establish with such identified sources procedures whereby minority group applicants may be referred to the contractor for employment consideration.
  - b. In the event the contractor has a valid bargaining agreement providing for exclusive hiring hall referrals, he is expected to observe the provisions of that agreement to the extent that the system permits the contractor's compliance with EEO contract provisions. (The DOL has held that where

implementation of such agreements have the effect of discriminating against minorities or women, or obligates the contractor to do the same, such implementation violates Executive Order 11246, as amended.)

- c. The contractor will encourage his present employees to refer minority group applicants for employment. Information and procedures with regard to referring minority group applicants will be discussed with employees.
5. **Personnel Actions:** Wages, working conditions, and employee benefits shall be established and administered, and personnel actions of every type, including hiring, upgrading, promotion, transfer, demotion, layoff, and termination, shall be taken without regard to race, color, religion, sex, national origin, age or disability. The following procedures shall be followed:
- a. The contractor will conduct periodic inspections of project sites to insure that working conditions and employee facilities do not indicate discriminatory treatment of project site personnel.
  - b. The contractor will periodically evaluate the spread of wages paid within each classification to determine any evidence of discriminatory wage practices.
  - c. The contractor will periodically review selected personnel actions in depth to determine whether there is evidence of discrimination. Where evidence is found, the contractor will promptly take corrective action. If the review indicates that the discrimination may extend beyond the actions reviewed, such corrective action shall include all affected persons.
  - d. The contractor will promptly investigate all complaints of alleged discrimination made to the contractor in connection with his obligations under this contract, will attempt to resolve such complaints, and will take appropriate corrective action within a reasonable time. If the investigation indicates that the discrimination may affect persons other than the complainant, such corrective action shall include such other persons. Upon completion of each investigation, the contractor will inform every complainant of all of his avenues of appeal.
6. **Training and Promotion:**
- a. The contractor will assist in locating, qualifying, and increasing the skills of minority group and women employees, and applicants for employment.
  - b. Consistent with the contractor's work force requirements and as permissible under Federal and State regulations, the contractor shall make full use of training programs, i.e., apprenticeship, and on-the-job training programs for the geographical area of contract performance. Where feasible, 25 percent of apprentices or trainees in each occupation shall be in their first year of apprenticeship or training. In the event a special provision for training is provided under this contract, this subparagraph will be superseded as indicated in the special provision.
  - c. The contractor will advise employees and applicants for employment of available training programs and entrance requirements for each.
  - d. The contractor will periodically review the training and promotion potential of minority group and women employees and will encourage eligible employees to apply for such training and promotion.
7. **Unions:** If the contractor relies in whole or in part upon unions as a source of employees, the contractor will use his/her best efforts to obtain the cooperation of such unions to increase opportunities for minority groups and women within the unions, and to effect referrals by such unions of minority and female employees. Actions by the contractor either directly or through a contractor's association acting as agent will include the procedures set forth below:
- a. The contractor will use best efforts to develop, in cooperation with the unions, joint training programs aimed toward qualifying more minority group members and women for membership in the unions and increasing the skills of minority group employees and women so that they may qualify for higher paying employment.
  - b. The contractor will use best efforts to incorporate an EEO clause into each union agreement to the end that such union will be contractually bound to refer applicants without regard to their race, color, religion, sex, national origin, age or disability.
  - c. The contractor is to obtain information as to the referral practices and policies of the labor union except that to the extent such information is within the exclusive possession of the labor union and such labor union refuses to furnish such information to the contractor, the contractor shall so certify to the SHA and shall set forth what efforts have been made to obtain such information.

- d. In the event the union is unable to provide the contractor with a reasonable flow of minority and women referrals within the time limit set forth in the collective bargaining agreement, the contractor will, through independent recruitment efforts, fill the employment vacancies without regard to race, color, religion, sex, national origin, age or disability; making full efforts to obtain qualified and/or qualifiable minority group persons and women. (The DOL has held that it shall be no excuse that the union with which the contractor has a collective bargaining agreement providing for exclusive referral failed to refer minority employees.) In the event the union referral practice prevents the contractor from meeting the obligations pursuant to Executive Order 11246, as amended, and these specifications, such contractor shall immediately notify the SHA.
8. **Selection of Subcontractors, Procurement of Materials and Leasing of Equipment:** The contractor shall not discriminate on the grounds of race, color, religion, sex, national origin, age or disability in the selection and retention of subcontractors, including procurement of materials and leases of equipment.
- a. The contractor shall notify all potential subcontractors and suppliers of his/her EEO obligations under this contract.
  - b. Disadvantaged business enterprises (DBE), as defined in 49 CFR 23, shall have equal opportunity to compete for and perform subcontracts which the contractor enters into pursuant to this contract. The contractor will use his best efforts to solicit bids from and to utilize DBE subcontractors or subcontractors with meaningful minority group and female representation among their employees. Contractors shall obtain lists of DBE construction firms from SHA personnel.
  - c. The contractor will use his best efforts to ensure subcontractor compliance with their EEO obligations.
9. **Records and Reports:** The contractor shall keep such records as necessary to document compliance with the EEO requirements. Such records shall be retained for a period of three years following completion of the contract work and shall be available at reasonable times and places for inspection by authorized representatives of the SHA and the FHWA.
- a. The records kept by the contractor shall document the following:
    - 1. The number of minority and non-minority group members and women employed in each work classification on the project;
    - 2. The progress and efforts being made in cooperation with unions, when applicable, to increase employment opportunities for minorities and women;
    - 3. The progress and efforts being made in locating, hiring, training, qualifying, and upgrading minority and female employees; and
    - 4. The progress and efforts being made in securing the services of DBE subcontractors or subcontractors with meaningful minority and female representation among their employees.
  - b. The contractors will submit an annual report to the SHA each July for the duration of the project, indicating the number of minority, women, and non-minority group employees currently engaged in each work classification required by the contract work. This information is to be reported on Form FHWA-1391. If on-the-job training is being required by special provision, the contractor will be required to collect and report training data.

### III. NONSEGREGATED FACILITIES

(Applicable to all Federal-aid construction contracts and to all related subcontracts of \$10,000 or more.)

- a. By submission of this bid, the execution of this contract or subcontract, or the consummation of this material supply agreement or purchase order, as appropriate, the bidder, Federal-aid construction contractor, subcontractor, material supplier, or vendor, as appropriate, certifies that the firm does not maintain or provide for its employees any segregated facilities at any of its establishments, and that the firm does not permit its employees to perform their services at any location, under its control, where segregated facilities are maintained. The firm agrees that a breach of this certification is a violation of the EEO provisions of this contract. The firm further certifies that no employee will be denied access to adequate facilities on the basis of sex or disability.
- b. As used in this certification, the term "segregated facilities" means any waiting rooms, work areas, restrooms and washrooms, restaurants and other eating areas, timeclocks, locker rooms, and other storage or dressing areas, parking lots, drinking fountains, recreation or entertainment areas, transportation, and housing facilities provided for employees which are segregated by explicit directive, or are, in fact,

segregated on the basis of race, color, religion, national origin, age or disability, because of habit, local custom, or otherwise. The only exception will be for the disabled when the demands for accessibility override (e.g. disabled parking).

- c. The contractor agrees that it has obtained or will obtain identical certification from proposed subcontractors or material suppliers prior to award of subcontracts or consummation of material supply agreements of \$10,000 or more and that it will retain such certifications in its files.

#### **IV. PAYMENT OF PREDETERMINED MINIMUM WAGE**

(Applicable to all Federal-aid construction contracts exceeding \$2,000 and to all related subcontracts, except for projects located on roadways classified as local roads or rural minor collectors, which are exempt.)

##### **1. General:**

- a. All mechanics and laborers employed or working upon the site of the work will be paid unconditionally and not less often than once a week and without subsequent deduction or rebate on any account [except such payroll deductions as are permitted by regulations (29 CFR 3) issued by the Secretary of Labor under the Copeland Act (40 U.S.C. 276c)] the full amounts of wages and bona fide fringe benefits (or cash equivalents thereof) due at time of payment. The payment shall be computed at wage rates not less than those contained in the wage determination of the Secretary of Labor (hereinafter "the wage determination") which is attached hereto and made a part hereof, regardless of any contractual relationship which may be alleged to exist between the contractor or its subcontractors and such laborers and mechanics. The wage determination (including any additional classifications and wage rates conformed under paragraph 2 of this Section IV and the DOL poster (WH-1321) or Form FHWA-1495) shall be posted at all times by the contractor and its subcontractors at the site of the work in a prominent and accessible place where it can be easily seen by the workers. For the purpose of this Section, contributions made or costs reasonably anticipated for bona fide fringe benefits under Section 1(b) (2) of the Davis- Bacon Act (40 U.S.C. 276a) on behalf of laborers or mechanics are considered wages paid to such laborers or mechanics, subject to the provisions of Section IV, paragraph 3b, hereof. Also, for the purpose of this Section, regular contributions made or costs incurred for more than a weekly period (but not less often than quarterly) under plans, funds, or programs, which cover the particular weekly period, are deemed to be constructively made or incurred during such weekly period. Such laborers and mechanics shall be paid the appropriate wage rate and fringe benefits on the wage determination for the classification of work actually performed, without regard to skill, except as provided in paragraphs 4 and 5 of this Section IV.
- b. Laborers or mechanics performing work in more than one classification may be compensated at the rate specified for each classification for the time actually worked therein, provided, that the employer's payroll records accurately set forth the time spent in each classification in which work is performed.
- c. All rulings and interpretations of the Davis-Bacon Act and related acts contained in 29 CFR 1, 3, and 5 are herein incorporated by reference in this contract.

##### **2. Classification:**

- a. The SHA contracting officer shall require that any class of laborers or mechanics employed under the contract, which is not listed in the wage determination, shall be classified in conformance with the wage determination.
- b. The contracting officer shall approve an additional classification, wage rate and fringe benefits only when the following criteria have been met:
  1. the work to be performed by the additional classification requested is not performed by a classification in the wage determination;
  2. the additional classification is utilized in the area by the construction industry;
  3. the proposed wage rate, including any bona fide fringe benefits, bears a reasonable relationship to the wage rates contained in the wage determination; and
  4. with respect to helpers, when such a classification prevails in the area in which the work is performed.
- c. If the contractor or subcontractors, as appropriate, the laborers and mechanics (if known) to be employed in the additional classification or their representatives, and the contracting officer agree on the classification and wage rate (including the amount designated for fringe benefits where appropriate), a report of the action taken shall be sent by the contracting officer to the DOL,



Administrator of the Wage and Hour Division, Employment Standards Administration, Washington, D.C. 20210. The Wage and Hour Administrator, or an authorized representative, will approve, modify, or disapprove every additional classification action within 30 days of receipt and so advise the contracting officer or will notify the contracting officer within the 30-day period that additional time is necessary.

- d. In the event the contractor or subcontractors, as appropriate, the laborers or mechanics to be employed in the additional classification or their representatives, and the contracting officer do not agree on the proposed classification and wage rate (including the amount designated for fringe benefits, where appropriate), the contracting officer shall refer the questions, including the views of all interested parties and the recommendation of the contracting officer, to the Wage and Hour Administrator for determination. Said Administrator, or an authorized representative, will issue a determination within 30 days of receipt and so advise the contracting officer or will notify the contracting officer within the 30-day period that additional time is necessary.
- e. The wage rate (including fringe benefits where appropriate) determined pursuant to paragraph 2c or 2d of this Section IV shall be paid to all workers performing work in the additional classification from the first day on which work is performed in the classification.

**3. Payment of Fringe Benefits:**

- a. Whenever the minimum wage rate prescribed in the contract for a class of laborers or mechanics includes a fringe benefit which is not expressed as an hourly rate, the contractor or subcontractors, as appropriate, shall either pay the benefit as stated in the wage determination or shall pay another bona fide fringe benefit or an hourly case equivalent thereof.
- b. If the contractor or subcontractor, as appropriate, does not make payments to a trustee or other third person, he/she may consider as a part of the wages of any laborer or mechanic the amount of any costs reasonably anticipated in providing bona fide fringe benefits under a plan or program, provided, that the Secretary of Labor has found, upon the written request of the contractor, that the applicable standards of the Davis-Bacon Act have been met. The Secretary of Labor may require the contractor to set aside in a separate account assets for the meeting of obligations under the plan or program.

**4. Apprentices and Trainees (Programs of the U.S. DOL) and Helpers:**

**a. Apprentices:**

- 1. Apprentices will be permitted to work at less than the predetermined rate for the work they performed when they are employed pursuant to and individually registered in a bona fide apprenticeship program registered with the DOL, Employment and Training Administration, Bureau of Apprenticeship and Training, or with a State apprenticeship agency recognized by the Bureau, or if a person is employed in his/her first 90 days of probationary employment as an apprentice in such an apprenticeship program, who is not individually registered in the program, but who has been certified by the Bureau of Apprenticeship and Training or a State apprenticeship agency (where appropriate) to be eligible for probationary employment as an apprentice.
- 2. The allowable ratio of apprentices to journeyman-level employees on the job site in any craft classification shall not be greater than the ratio permitted to the contractor as to the entire work force under the registered program. Any employee listed on a payroll at an apprentice wage rate, who is not registered or otherwise employed as stated above, shall be paid not less than the applicable wage rate listed in the wage determination for the classification of work actually performed. In addition, any apprentice performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed. Where a contractor or subcontractor is performing construction on a project in a locality other than that in which its program is registered, the ratios and wage rates (expressed in percentages of the journeyman-level hourly rate) specified in the contractor's or subcontractor's registered program shall be observed.
- 3. Every apprentice must be paid at not less than the rate specified in the registered program for the apprentice's level of progress, expressed as a percentage of the journeyman-level hourly rate specified in the applicable wage determination. Apprentices shall be paid fringe benefits in accordance with the provisions of the apprenticeship program. If the apprenticeship program does not specify fringe benefits, apprentices must be paid the full amount of fringe benefits listed on the wage determination for the applicable classification. If the Administrator for the Wage and Hour Division determines that a

different practice prevails for the applicable apprentice classification, fringes shall be paid in accordance with that determination.

4. In the event the Bureau of Apprenticeship and Training, or a State apprenticeship agency recognized by the Bureau, withdraws approval of an apprenticeship program, the contractor or subcontractor will no longer be permitted to utilize apprentices at less than the applicable predetermined rate for the comparable work performed by regular employees until an acceptable program is approved.

b. Trainees:

1. Except as provided in 29 CFR 5.16, trainees will not be permitted to work at less than the predetermined rate for the work performed unless they are employed pursuant to and individually registered in a program which has received prior approval, evidenced by formal certification by the DOL, Employment and Training Administration.
2. The ratio of trainees to journeyman-level employees on the job site shall not be greater than permitted under the plan approved by the Employment and Training Administration. Any employee listed on the payroll at a trainee rate who is not registered and participating in a training plan approved by the Employment and Training Administration shall be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed. In addition, any trainee performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed.
3. Every trainee must be paid at not less than the rate specified in the approved program for his/her level of progress, expressed as a percentage of the journeyman-level hourly rate specified in the applicable wage determination. Trainees shall be paid fringe benefits in accordance with the provisions of the trainee program. If the trainee program does not mention fringe benefits, trainees shall be paid the full amount of fringe benefits listed on the wage determination unless the Administrator of the Wage and Hour Division determines that there is an apprenticeship program associated with the corresponding journeyman-level wage rate on the wage determination which provides for less than full fringe benefits for apprentices, in which case such trainees shall receive the same fringe benefits as apprentices.
4. In the event the Employment and Training Administration withdraws approval of a training program, the contractor or subcontractor will no longer be permitted to utilize trainees at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

c. Helpers:

Helpers will be permitted to work on a project if the helper classification is specified and defined on the applicable wage determination or is approved pursuant to the conformance procedure set forth in Section IV.2. Any worker listed on a payroll at a helper wage rate, who is not a helper under an approved definition, shall be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed.

5. **Apprentices and Trainees (Programs of the U.S. DOT):**

Apprentices and trainees working under apprenticeship and skill training programs which have been certified by the Secretary of Transportation as promoting EEO in connection with Federal-aid highway construction programs are not subject to the requirements of paragraph 4 of this Section IV. The straight time hourly wage rates for apprentices and trainees under such programs will be established by the particular programs. The ratio of apprentices and trainees to journeymen shall not be greater than permitted by the terms of the particular program.

6. **Withholding:**

The SHA shall upon its own action or upon written request of an authorized representative of the DOL withhold, or cause to be withheld, from the contractor or subcontractor under this contract or any other Federal contract with the same prime contractor, or any other Federally-assisted contract subject to Davis-Bacon prevailing wage requirements which is held by the same prime contractor, as much of the accrued payments or advances as may be considered necessary to pay laborers and mechanics, including apprentices, trainees, and helpers, employed by the contractor or any subcontractor the full amount of wages required by the contract. In the event of failure to pay any laborer or mechanic, including any apprentice, trainee, or helper, employed or working on the site of the work, all or part of the wages required by the contract, the SHA contracting officer may, after written notice to the contractor, take such action as

may be necessary to cause the suspension of any further payment, advance, or guarantee of funds until such violations have ceased.

**7. Overtime Requirements:**

No contractor or subcontractor contracting for any part of the contract work which may require or involve the employment of laborers, mechanics, watchmen, or guards (including apprentices, trainees, and helpers described in paragraphs 4 and 5 above) shall require or permit any laborer, mechanic, watchman, or guard in any workweek in which he/she is employed on such work, to work in excess of 40 hours in such workweek unless such laborer, mechanic, watchman, or guard receives compensation at a rate not less than one-and-one-half times his/her basic rate of pay for all hours worked in excess of 40 hours in such workweek.

**8. Violation:**

Liability for Unpaid Wages; Liquidated Damages: In the event of any violation of the clause set forth in paragraph 7 above, the contractor and any subcontractor responsible thereof shall be liable to the affected employee for his/her unpaid wages. In addition, such contractor and subcontractor shall be liable to the United States (in the case of work done under contract for the District of Columbia or a territory, to such District or to such territory) for liquidated damages. Such liquidated damages shall be computed with respect to each individual laborer, mechanic, watchman, or guard employed in violation of the clause set forth in paragraph 7, in the sum of \$10 for each calendar day on which such employee was required or permitted to work in excess of the standard work week of 40 hours without payment of the overtime wages required by the clause set forth in paragraph 7.

**9. Withholding for Unpaid Wages and Liquidated Damages:**

The SHA shall upon its own action or upon written request of any authorized representative of the DOL withhold, or cause to be withheld, from any monies payable on account of work performed by the contractor or subcontractor under any such contract or any other Federal contract with the same prime contractor, or any other Federally-assisted contract subject to the contract Work Hours and Safety Standards Act, which is held by the same prime contractor, such sums as may be determined to be necessary to satisfy any liabilities of such contractor or subcontractor for unpaid wages and liquidated damages as provided in the clause set forth in paragraph 8 above.

**V. STATEMENTS AND PAYROLLS**

(Applicable to all Federal-aid construction contracts exceeding \$2,000 and to all related subcontracts, except for projects located on roadways classified as local roads or rural collectors, which are exempt.)

**1. Compliance with Copeland Regulations (29 CFR 3):**

The contractor shall comply with the Copeland Regulations of the Secretary of Labor which are herein incorporated by reference.

**2. Payrolls and Payroll Records:**

- a. Payrolls and basic records relating thereto shall be maintained by the contractor and each subcontractor during the course of the work and preserved for a period of 3 years from the date of completion of the contract for all laborers, mechanics, apprentices, trainees, watchmen, helpers, and guards working at the site of the work.
- b. The payroll records shall contain the name, social security number, and address of each such employee; his or her correct classification; hourly rates of wages paid (including rates of contributions or costs anticipated for bona fide fringe benefits or cash equivalent thereof the types described in Section 1(b)(2)(B) of the Davis Bacon Act); daily and weekly number of hours worked; deductions made; and actual wages paid. In addition, for Appalachian contracts, the payroll records shall contain a notation indicating whether the employee does, or does not, normally reside in the labor area as defined in Attachment A, paragraph 1. Whenever the Secretary of Labor, pursuant to Section IV, paragraph 3b, has found that the wages of any laborer or mechanic include the amount of any costs reasonably anticipated in providing benefits under a plan or program described in Section 1(b)(2)(B) of the Davis Bacon Act, the contractor and each subcontractor shall maintain records which show that the commitment to provide such benefits is enforceable, that the plan or program is financially responsible, that the plan or program has been communicated in writing to the laborers or mechanics affected, and show the cost anticipated or the actual cost incurred in providing benefits. Contractors or subcontractors employing apprentices or trainees under approved programs shall maintain written evidence of the registration of apprentices and trainees, and ratios and wage rates prescribed in the applicable programs.

- c. Each contractor and subcontractor shall furnish, each week in which any contract work is performed, to the SHA resident engineer a payroll of wages paid each of its employees (including apprentices, trainees, and helpers, described in Section IV, paragraphs 4 and 5, and watchmen and guards engaged on work during the preceding weekly payroll period). The payroll submitted shall set out accurately and completely all of the information required to be maintained under paragraph 2b of this Section V. This information may be submitted in any form desired. Optional Form WH-347 is available for this purpose and may be purchased from the Superintendent of Documents (Federal stock number 029-005-0014-1), U.S. Government Printing Office, Washington, D.C. 20402. The prime contractor is responsible for the submission of copies of payrolls by all subcontractors.
- d. Each payroll submitted shall be accompanied by a "Statement of Compliance," signed by the contractor or subcontractor or his/her agent who pays or supervises the payment of the persons employed under the contract and shall certify the following:
  - 1. that the payroll for the payroll period contains the information required to be maintained under paragraph 2b of this Section V and that such information is correct and complete;
  - 2. that such laborer or mechanic (including each helper, apprentice, and trainee) employed on the contract during the payroll period has been paid the full weekly wages earned, without rebate, either directly or indirectly, and that no deductions have been made either directly or indirectly from the full wages earned, other than permissible deductions as set forth in the Regulations, 29 CFR 3;
  - 3. that each laborer or mechanic has been paid not less than the applicable wage rate and fringe benefits or cash equivalent for the classification of work performed, as specified in the applicable wage determination incorporated into the contract.
- e. The weekly submission of a properly executed certification set forth on the reverse side of Optional Form WH-347 shall satisfy the requirement for submission of the "Statement of Compliance" required by paragraph 2d of this Section V.
- f. The falsification of any of the above certifications may subject the contractor to civil or criminal prosecution under 18 U.S.C. 1001 and 31 U.S.C. 231.
- g. The contractor or subcontractor shall make the records required under paragraph 2b of this Section V available for inspection, copying, or transcription by authorized representatives of the SHA, the FHWA, or the DOL, and shall permit such representatives to interview employees during working hours on the job. If the contractor or subcontractor fails to submit the required records or to make them available, the SHA, the FHWA, the DOL, or all may, after written notice to the contractor, sponsor, applicant, or owner, take such actions as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds. Furthermore, failure to submit the required records upon request or to make such records available may be grounds for debarment action pursuant to 29 CFR 5.12.

## **VI. RECORD OF MATERIALS, SUPPLIES, AND LABOR**

(As of May 22, 2007, Form FHWA-47 is no longer required.)

## **VII. SUBLETTING OR ASSIGNING THE CONTRACT**

- 1. The contractor shall perform with its own organization contract work amounting to not less than 30 percent (or a greater percentage if specified elsewhere in the contract) of the total original contract price, excluding any specialty items designated by the State. Specialty items may be performed by subcontract and the amount of any such specialty items performed may be deducted from the total original contract price before computing the amount of work required to be performed by the contractor's own organization (23 CFR 635).
  - a. "Its own organization" shall be construed to include only workers employed and paid directly by the prime contractor and equipment owned or rented by the prime contractor, with or without operators. Such term does not include employees or equipment of a subcontractor, assignee, or agent of the prime contractor.
  - b. "Specialty Items" shall be construed to be limited to work that requires highly specialized knowledge, abilities, or equipment not ordinarily available in the type of contracting organizations qualified and expected to bid on the contract as a whole and in general are to be limited to minor components of the overall contract.

2. The contract amount upon which the requirements set forth in paragraph 1 of Section VII is computed includes the cost of material and manufactured products which are to be purchased or produced by the contractor under the contract provisions.
3. The contractor shall furnish (a) a competent superintendent or supervisor who is employed by the firm, has full authority to direct performance of the work in accordance with the contract requirements, and is in charge of all construction operations (regardless of who performs the work) and (b) such other of its own organizational resources (supervision, management, and engineering services) as the SHA contracting officer determines is necessary to assure the performance of the contract.
4. No portion of the contract shall be sublet, assigned or otherwise disposed of except with the written consent of the SHA contracting officer, or authorized representative, and such consent when given shall not be construed to relieve the contractor of any responsibility for the fulfillment of the contract. Written consent will be given only after the SHA has assured that each subcontract is evidenced in writing and that it contains all pertinent provisions and requirements of the prime contract.

#### **VIII. SAFETY: ACCIDENT PREVENTION**

1. In the performance of this contract the contractor shall comply with all applicable Federal, State, and local laws governing safety, health, and sanitation (23 CFR 635). The contractor shall provide all safeguards, safety devices and protective equipment and take any other needed actions as it determines, or as the SHA contracting officer may determine, to be reasonably necessary to protect the life and health of employees on the job and the safety of the public and to protect property in connection with the performance of the work covered by the contract.
2. It is a condition of this contract, and shall be made a condition of each subcontract, which the contractor enters into pursuant to this contract, that the contractor and any subcontractor shall not permit any employee, in performance of the contract, to work in surroundings or under conditions which are unsanitary, hazardous or dangerous to his/her health or safety, as determined under construction safety and health standards (29 CFR 1926) promulgated by the Secretary of Labor, in accordance with Section 107 of the Contract Work Hours and Safety Standards Act (40 U.S.C. 333).
3. Pursuant to 29 CFR 1926.3, it is a condition of this contract that the Secretary of Labor or authorized representative thereof, shall have right of entry to any site of contract performance to inspect or investigate the matter of compliance with the construction safety and health standards and to carry out the duties of the Secretary under Section 107 of the Contract Work Hours and Safety Standards Act (40 U.S.C. 333).

#### **IX. FALSE STATEMENTS CONCERNING HIGHWAY PROJECTS**

In order to assure high quality and durable construction in conformity with approved plans and specifications and a high degree of reliability on statements and representations made by Engineers, contractors, suppliers, and workers on Federal-aid highway projects, it is essential that all persons concerned with the project perform their functions as carefully, thoroughly, and honestly as possible. Willful falsification, distortion, or misrepresentation with respect to any facts related to the project is a violation of Federal law. To prevent any misunderstanding regarding the seriousness of these and similar acts, the following notice shall be posted on each Federal-aid highway project (23 CFR 635) in one or more places where it is readily available to all persons concerned with the project:

#### **NOTICE TO ALL PERSONNEL ENGAGED ON FEDERAL-AID HIGHWAY PROJECTS**

18 U.S.C. 1020 reads as follows:

"Whoever, being an officer, agent, or employee of the United States, or of any State or Territory, or whoever, whether a person, association, firm, or corporation, knowingly makes any false statement, false representation, or false report as to the character, quality, quantity, or cost of the material used or to be used, or the quantity or quality of the work performed or to be performed, or the cost thereof in connection with the submission of plans, maps, specifications, contracts, or costs of construction on any highway or related project submitted for approval to the Secretary of Transportation; or

Whoever knowingly makes any false statement, false representation, false report or false claim with respect to the character, quality, quantity, or cost of any work performed or to be performed, or materials furnished or to be furnished, in connection with the construction of any highway or related project approved by the Secretary of Transportation; or

Whoever knowingly makes any false statement or false representation as to material fact in any statement, certificate, or report submitted pursuant to provisions of the Federal-aid Roads Act approved July 1, 1916, (39 Stat. 355), as amended and supplemented;

Shall be fined not more than \$10,000 or imprisoned not more than 5 years or both."

## **X. IMPLEMENTATION OF CLEAN AIR ACT AND FEDERAL WATER POLLUTION CONTROL ACT**

(Applicable to all Federal-aid construction contracts and to all related subcontracts of \$100,000 or more.)

By submission of this bid or the execution of this contract, or subcontract, as appropriate, the bidder, Federal-aid construction contractor, or subcontractor, as appropriate, will be deemed to have stipulated as follows:

1. That any facility that is or will be utilized in the performance of this contract, unless such contract is exempt under the Clean Air Act, as amended (42 U.S.C. 1857 *et seq.*, as amended by Pub.L. 91-604), and under the Federal Water Pollution Control Act, as amended (33 U.S.C. 1251 *et seq.*, as amended by Pub.L. 92-500), Executive Order 11738, and regulations in implementation thereof (40 CFR 15) is not listed, on the date of contract award, on the U.S. Environmental Protection Agency (EPA) List of Violating Facilities pursuant to 40 CFR 15.20.
2. That the firm agrees to comply and remain in compliance with all the requirements of Section 114 of the Clean Air Act and Section 308 of the Federal Water Pollution Control Act and all regulations and guidelines listed thereunder.
3. That the firm shall promptly notify the SHA of the receipt of any communication from the Director, Office of Federal Activities, EPA, indicating that a facility that is or will be utilized for the contract is under consideration to be listed on the EPA List of Violating Facilities.
4. That the firm agrees to include or cause to be included the requirements of paragraph 1 through 4 of this Section X in every nonexempt subcontract, and further agrees to take such action as the government may direct as a means of enforcing such requirements.

## **XI. CERTIFICATION REGARDING DEBARMENT, SUSPENSION, INELIGIBILITY AND VOLUNTARY EXCLUSION**

### **1. Instructions for Certification - Primary Covered Transactions:**

(Applicable to all Federal-aid contracts - 49 CFR 29)

- a. By signing and submitting this proposal, the prospective primary participant is providing the certification set out below.
- b. The inability of a person to provide the certification set out below will not necessarily result in denial of participation in this covered transaction. The prospective participant shall submit an explanation of why it cannot provide the certification set out below. The certification or explanation will be considered in connection with the department or agency's determination whether to enter into this transaction. However, failure of the prospective primary participant to furnish a certification or an explanation shall disqualify such a person from participation in this transaction.
- c. The certification in this clause is a material representation of fact upon which reliance was placed when the department or agency determined to enter into this transaction. If it is later determined that the prospective primary participant knowingly rendered an erroneous certification, in addition to other remedies available to the Federal Government, the department or agency may terminate this transaction for cause of default.
- d. The prospective primary participant shall provide immediate written notice to the department or agency to whom this proposal is submitted if any time the prospective primary participant learns that its certification was erroneous when submitted or has become erroneous by reason of changed circumstances.
- e. The terms "covered transaction," "debarred," "suspended," "ineligible," "lower tier covered transaction," "participant," "person," "primary covered transaction," "principal," "proposal," and "voluntarily excluded," as used in this clause, have the meanings set out in the Definitions and Coverage sections of rules implementing Executive Order 12549. You may contact the department or agency to which this proposal is submitted for assistance in obtaining a copy of those regulations.
- f. The prospective primary participant agrees by submitting this proposal that, should the proposed covered transaction be entered into, it shall not knowingly enter into any lower tier covered transaction with a person who is debarred, suspended, declared ineligible, or voluntarily excluded from participation in this covered transaction, unless authorized by the department or agency entering into this transaction.

- g. The prospective primary participant further agrees by submitting this proposal that it will include the clause titled "Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion-Lower Tier Covered Transaction," provided by the department or agency entering into this covered transaction, without modification, in all lower tier covered transactions and in all solicitations for lower tier covered transactions.
- h. A participant in a covered transaction may rely upon a certification of a prospective participant in a lower tier covered transaction that is not debarred, suspended, ineligible, or voluntarily excluded from the covered transaction, unless it knows that the certification is erroneous. A participant may decide the method and frequency by which it determines the eligibility of its principals. Each participant may, but is not required to, check the nonprocurement portion of the "Lists of Parties Excluded From Federal Procurement or Nonprocurement Programs" (Nonprocurement List) which is compiled by the General Services Administration.
- i. Nothing contained in the foregoing shall be construed to require establishment of a system of records in order to render in good faith the certification required by this clause. The knowledge and information of participant is not required to exceed that which is normally possessed by a prudent person in the ordinary course of business dealings.
- j. Except for transactions authorized under paragraph f of these instructions, if a participant in a covered transaction knowingly enters into a lower tier covered transaction with a person who is suspended, debarred, ineligible, or voluntarily excluded from participation in this transaction, in addition to other remedies available to the Federal Government, the department or agency may terminate this transaction for cause or default.

\* \* \* \* \*

#### **Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion--Primary Covered Transactions**

1. The prospective primary participant certifies to the best of its knowledge and belief, that it and its principals:
  - a. Are not presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from covered transactions by any Federal department or agency;
  - b. Have not within a 3-year period preceding this proposal been convicted of or had a civil judgement rendered against them for commission of fraud or a criminal offense in connection with obtaining, attempting to obtain, or performing a public (Federal, State or local) transaction or contract under a public transaction; violation of Federal or State antitrust statutes or commission of embezzlement, theft, forgery, bribery, falsification or destruction of records, making false statements, or receiving stolen property;
  - c. Are not presently indicted for or otherwise criminally or civilly charged by a governmental entity (Federal, State or local) with commission of any of the offenses enumerated in paragraph 1b of this certification; and
  - d. Have not within a 3-year period preceding this application/proposal had one or more public transactions (Federal, State or local) terminated for cause or default.
2. Where the prospective primary participant is unable to certify to any of the statements in this certification, such prospective participant shall attach an explanation to this proposal.

\* \* \* \* \*

#### **2. Instructions for Certification - Lower Tier Covered Transactions:**

(Applicable to all subcontracts, purchase orders and other lower tier transactions of \$25,000 or more - 49 CFR 29)

- a. By signing and submitting this proposal, the prospective lower tier is providing the certification set out below.
- b. The certification in this clause is a material representation of fact upon which reliance was placed when this transaction was entered into. If it is later determined that the prospective lower tier

participant knowingly rendered an erroneous certification, in addition to other remedies available to the Federal Government, the department, or agency with which this transaction originated may pursue available remedies, including suspension and/or debarment.

- c. The prospective lower tier participant shall provide immediate written notice to the person to which this proposal is submitted if at any time the prospective lower tier participant learns that its certification was erroneous by reason of changed circumstances.
- d. The terms "covered transaction," "debarred," "suspended," "ineligible," "primary covered transaction," "participant," "person," "principal," "proposal," and "voluntarily excluded," as used in this clause, have the meanings set out in the Definitions and Coverage sections of rules implementing Executive Order 12549. You may contact the person to which this proposal is submitted for assistance in obtaining a copy of those regulations.
- e. The prospective lower tier participant agrees by submitting this proposal that, should the proposed covered transaction be entered into, it shall not knowingly enter into any lower tier covered transaction with a person who is debarred, suspended, declared ineligible, or voluntarily excluded from participation in this covered transaction, unless authorized by the department or agency with which this transaction originated.
- f. The prospective lower tier participant further agrees by submitting this proposal that it will include this clause titled "Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion-Lower Tier Covered Transaction," without modification, in all lower tier covered transactions and in all solicitations for lower tier covered transactions.
- g. A participant in a covered transaction may rely upon a certification of a prospective participant in a lower tier covered transaction that is not debarred, suspended, ineligible, or voluntarily excluded from the covered transaction, unless it knows that the certification is erroneous. A participant may decide the method and frequency by which it determines the eligibility of its principals. Each participant may, but is not required to, check the Nonprocurement List.
- h. Nothing contained in the foregoing shall be construed to require establishment of a system of records in order to render in good faith the certification required by this clause. The knowledge and information of participant is not required to exceed that which is normally possessed by a prudent person in the ordinary course of business dealings.
- i. Except for transactions authorized under paragraph e of these instructions, if a participant in a covered transaction knowingly enters into a lower tier covered transaction with a person who is suspended, debarred, ineligible, or voluntarily excluded from participation in this transaction, in addition to other remedies available to the Federal Government, the department or agency with which this transaction originated may pursue available remedies, including suspension and/or debarment.

\* \* \* \* \*

#### **Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion--Lower Tier Covered Transactions:**

1. The prospective lower tier participant certifies, by submission of this proposal, that neither it nor its principals is presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from participation in this transaction by any Federal department or agency.
2. Where the prospective lower tier participant is unable to certify to any of the statements in this certification, such prospective participant shall attach an explanation to this proposal.

\* \* \* \* \*

## **XII. CERTIFICATION REGARDING USE OF CONTRACT FUNDS FOR LOBBYING**

(Applicable to all Federal-aid construction contracts and to all related subcontracts which exceed \$100,000 - 49 CFR 20)

1. The prospective participant certifies, by signing and submitting this bid or proposal, to the best of his or her knowledge and belief, that:
  - a. No Federal appropriated funds have been paid or will be paid, by or on behalf of the undersigned, to any person for influencing or attempting to influence an officer or employee of any Federal agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in



connection with the awarding of any Federal contract, the making of any Federal grant, the making of any Federal loan, the entering into of any cooperative agreement, and the extension, continuation, renewal, amendment, or modification of any Federal contract, grant, loan, or cooperative agreement.

- b. If any funds other than Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any Federal agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with this Federal contract, grant, loan, or cooperative agreement, the undersigned shall complete and submit Standard Form-LLL, "Disclosure Form to Report Lobbying," in accordance with its instructions.
2. This certification is a material representation of fact upon which reliance was placed when this transaction was made or entered into. Submission of this certification is a prerequisite for making or entering into this transaction imposed by 31 U.S.C. 1352. Any person who fails to file the required certification shall be subject to a civil penalty of not less than \$10,000 and not more than \$100,000 for each such failure.
  3. The prospective participant also agrees by submitting his or her bid or proposal that he or she shall require that the language of this certification be included in all lower tier subcontracts, which exceed \$100,000 and that all such recipients shall certify and disclose accordingly.

#### **7-1.50C Female and Minority Goals**

To comply with Section II, "Nondiscrimination," of "Required Contract Provisions Federal-Aid Construction Contracts," the Department is including in Section 7-1.50C, "Female and Minority Goals," female and minority utilization goals for Federal-aid construction contracts and subcontracts that exceed \$10,000.

The nationwide goal for female utilization is 6.9 percent.

The goals for minority utilization [45 Fed Reg 65984 (10/3/1980)] are as follows:

### Minority Utilization Goals

Economic Area		Goal (Percent)
174	Redding CA: Non-SMSA Counties: CA Lassen; CA Modoc; CA Plumas; CA Shasta; CA Siskiyou; CA Tehama	6.8
175	Eureka, CA Non-SMSA Counties: CA Del Norte; CA Humboldt; CA Trinity	6.6
176	San Francisco-Oakland-San Jose, CA: SMSA Counties: 7120 Salinas-Seaside-Monterey, CA CA Monterey 7360 San Francisco-Oakland CA Alameda; CA Contra Costa; CA Marin; CA San Francisco; CA San Mateo 7400 San Jose, CA CA Santa Clara, CA 7485 Santa Cruz, CA CA Santa Cruz 7500 Santa Rosa CA Sonoma 8720 Vallejo-Fairfield-Napa, CA CA Napa; CA Solano Non-SMSA Counties: CA Lake; CA Mendocino; CA San Benito	28.9  25.6   19.6  14.9  9.1  17.1  23.2
177	Sacramento, CA: SMSA Counties: 6920 Sacramento, CA CA Placer; CA Sacramento; CA Yolo Non-SMSA Counties CA Butte; CA Colusa; CA El Dorado; CA Glenn; CA Nevada; CA Sierra; CA Sutter; CA Yuba	16.1  14.3
178	Stockton-Modesto, CA: SMSA Counties: 5170 Modesto, CA CA Stanislaus 8120 Stockton, CA CA San Joaquin Non-SMSA Counties CA Alpine; CA Amador; CA Calaveras; CA Mariposa; CA Merced; CA Toulumne	12.3  24.3  19.8
179	Fresno-Bakersfield, CA SMSA Counties: 0680 Bakersfield, CA CA Kern 2840 Fresno, CA CA Fresno Non-SMSA Counties: CA Kings; CA Madera; CA Tulare	19.1  26.1  23.6
180	Los Angeles, CA: SMSA Counties: 0360 Anaheim-Santa Ana-Garden Grove, CA CA Orange 4480 Los Angeles-Long Beach, CA CA Los Angeles 6000 Oxnard-Simi Valley-Ventura, CA CA Ventura 6780 Riverside-San Bernardino-Ontario, CA	11.9  28.3  21.5  19.0

	CA Riverside; CA San Bernardino 7480 Santa Barbara-Santa Maria-Lompoc, CA CA Santa Barbara Non-SMSA Counties CA Inyo; CA Mono; CA San Luis Obispo	19.7 24.6
181	San Diego, CA: SMSA Counties 7320 San Diego, CA CA San Diego Non-SMSA Counties CA Imperial	16.9 18.2

For each July during which work is performed under the contract, you and each non-material-supplier subcontractor with a subcontract of \$10,000 or more must complete Form FHWA PR-1391 (Appendix C to 23 CFR 230). Submit the forms by August 15.

#### **7-1.50D Training**

Section 7-1.50D, "Training," applies if a number of trainees or apprentices is specified in the special provisions.

As part of your equal opportunity affirmative action program, provide on-the-job training to develop full journeymen in the types of trades or job classifications involved.

You have primary responsibility for meeting this training requirement.

If you subcontract a contract part, determine how many trainees or apprentices are to be trained by the subcontractor.

Include these training requirements in your subcontract.

Where feasible, 25 percent of apprentices or trainees in each occupation must be in their 1st year of apprenticeship or training.

Distribute the number of apprentices or trainees among the work classifications on the basis of your needs and the availability of journeymen in the various classifications within a reasonable recruitment area.

Before starting work, submit to the Department:

1. Number of apprentices or trainees to be trained for each classification
2. Training program to be used
3. Training starting date for each classification

Obtain the Department's approval for this submitted information before you start work. The Department credits you for each apprentice or trainee you employ on the work who is currently enrolled or becomes enrolled in an approved program.

The primary objective of Section 7-1.50D, "Training," is to train and upgrade minorities and women toward journeymen status. Make every effort to enroll minority and women apprentices or trainees, such as conducting systematic and direct recruitment through public and private sources likely to yield minority and women apprentices or trainees, to the extent they are available within a reasonable recruitment area. Show that you have made the efforts. In making these efforts, do not discriminate against any applicant for training.

Do not employ as an apprentice or trainee an employee:

1. In any classification in which the employee has successfully completed a training course leading to journeyman status or in which the employee has been employed as a journeyman
2. Who is not registered in a program approved by the US Department of Labor, Bureau of Apprenticeship and Training

Ask the employee if the employee has successfully completed a training course leading to journeyman status or has been employed as a journeyman. Your records must show the employee's answers to the questions.

In your training program, establish the minimum length and training type for each classification. The Department and FHWA approves a program if one of the following is met:

1. It is calculated to:
  - 1.1. Meet the your equal employment opportunity responsibilities
  - 1.2. Qualify the average apprentice or trainee for journeyman status in the classification involved by the end of the training period



For a Federal-aid contract, the Department may terminate your control of the work for failure to include "Required Contract Provisions, Federal-Aid Construction Contracts" in subcontracts.

Contract No. 04-0120T4  
69 of 220

If approval is granted, the Engineer will accept the non-itemized invoices for specialty work performed, provided the invoices are at current market rates. Markup percentages of Section 9-1.03A, "Work Performed by Contractor," will not apply. A markup of 10 percent will be added to the total cost of the extra work. The 10 percent markup shall reimburse the Contractor for additional administrative costs, and no other payment will be made by reason of performance of the extra work by a specialist.

If approval is not granted prior to the start of the proposed specialty work, the Contractor or subcontractor shall itemize labor, material, and equipment rental costs and apply percentage markups as required by Section 9-1.03A, "Work Performed by Contractor."

**In Section 9-1.03C delete the 6th paragraph.**

**Replace Section 9-1.04 with:**

**9-1.04 NOTICE OF POTENTIAL CLAIM**

It is the intention of this section that disputes between the parties arising under and by virtue of the contract be brought to the attention of the Engineer at the earliest possible time in order that the matters may be resolved, if possible, or other appropriate action promptly taken.

Disputes will not be considered unless the Contractor has first complied with specified notice or protest requirements, including Section 4-1.03, "Changes," Section 5-1.116, "Differing Site Conditions," Section 8-1.06, "Time of Completion," Section 8-1.07, "Liquidated Damages," and Section 8-1.10, "Utility and Non-Highway Facilities."

For disputes arising under and by virtue of the contract, including an act or failure to act by the Engineer, the Contractor shall provide a signed written initial notice of potential claim to the Engineer within 5 days from the date the dispute first arose. The initial notice of potential claim shall provide the nature and circumstances involved in the dispute which shall remain consistent through the dispute. The initial notice of potential claim shall be submitted on Form CEM-6201A furnished by the Department and shall be certified with reference to the California False Claims Act, Government Code Sections 12650-12655. The Contractor shall assign an exclusive identification number for each dispute, determined by chronological sequencing, based on the date of the dispute.

The exclusive identification number for each dispute shall be used on the following corresponding documents:

1. Initial notice of potential claim
2. Supplemental notice of potential claim
3. Full and final documentation of potential claim
4. Corresponding claim included in the Contractor's written statement of claims

The Contractor shall provide the Engineer the opportunity to examine the site of work within 5 days from the date of the initial notice of potential claim. The Contractor shall proceed with the performance of contract work unless otherwise specified or directed by the Engineer.

Throughout the disputed work, the Contractor shall maintain records that provide a clear distinction between the incurred direct costs of disputed work and that of undisputed work. The Contractor shall allow the Engineer access to the Contractor's project records deemed necessary by the Engineer to evaluate the potential claim within 20 days of the date of the Engineer's written request.

Within 15 days of submitting the initial notice of potential claim, the Contractor shall provide a signed supplemental notice of potential claim to the Engineer that provides the following information:

1. The complete nature and circumstances of the dispute which caused the potential claim
2. The contract provisions that provide the basis of claim
3. The estimated cost of the potential claim, including an itemized breakdown of individual costs and how the estimate was determined
4. A time impact analysis of the project schedule that illustrates the effect on the scheduled completion date due to schedule changes or disruptions where a request for adjustment of contract time is made

The information provided in items 1 and 2 above shall provide the Contractor's complete reasoning for additional compensation or adjustments.

The supplemental notice of potential claim shall be submitted on Form CEM-6201B furnished by the Department and shall be certified with reference to the California False Claims Act, Government Code Sections 12650-12655. The Engineer will evaluate the information presented in the supplemental notice of potential claim

and provide a written response to the Contractor within 20 days of its receipt. If the estimated cost or effect on the scheduled completion date changes, the Contractor shall update information in items 3 and 4 above as soon as the change is recognized and submit this information to the Engineer.

Within 30 days of the completion of work related to the potential claim, the Contractor shall provide the full and final documentation of potential claim to the Engineer that provides the following information:

1. A detailed factual narration of events fully describing the nature and circumstances that caused the dispute, including, but not limited to, necessary dates, locations, and items of work affected by the dispute
2. The specific provisions of the contract that support the potential claim and a statement of the reasons these provisions support and provide a basis for entitlement of the potential claim
3. When additional monetary compensation is requested, the exact amount requested calculated in conformance with Section 9-1.03, "Force Account Payment," or Section 8-1.09, "Right of Way Delays," including an itemized breakdown of individual costs. These costs shall be segregated into the following cost categories:
  - 3.1. Labor – A listing of individuals, classifications, regular hours and overtime hours worked, dates worked, and other pertinent information related to the requested reimbursement of labor costs
  - 3.2. Materials – Invoices, purchase orders, location of materials either stored or incorporated into the work, dates materials were transported to the project or incorporated into the work, and other pertinent information related to the requested reimbursement of material costs
  - 3.3. Equipment – Listing of detailed description (make, model, and serial number), hours of use, dates of use and equipment rates. Equipment rates shall be at the applicable State rental rate as listed in the Department of Transportation publication entitled "Labor Surcharge and Equipment Rental Rates," in effect when the affected work related to the dispute was performed.
  - 3.4. Other categories as specified by the Contractor or the Engineer
4. When an adjustment of contract time is requested the following information shall be provided:
  - 4.1. The specific dates for which contract time is being requested
  - 4.2. The specific reasons for entitlement to a contract time adjustment
  - 4.3. The specific provisions of the contract that provide the basis for the requested contract time adjustment
  - 4.4. A detailed time impact analysis of the project schedule. The time impact analysis shall show the effect of changes or disruptions on the scheduled completion date to demonstrate entitlement to a contract time adjustment.
5. The identification and copies of the Contractor's documents and the substance of oral communications that support the potential claim

The full and final documentation of the potential claim shall be submitted on Form CEM-6201C furnished by the Department and shall be certified with reference to the California False Claims Act, Government Code Sections 12650-12655.

Pertinent information, references, arguments, and data to support the potential claim shall be included in the full and final documentation of potential claim. Information submitted subsequent to the full and final documentation submittal will not be considered. Information required in the full and final documentation of potential claim, as listed in items 1 to 5 above, that is not applicable to the dispute may be exempted as determined by the Engineer. No full and final documentation of potential claim will be considered that does not have the same nature and circumstances, and basis of claim as those specified on the initial and supplemental notices of potential claim.

The Engineer will evaluate the information presented in the full and final documentation of potential claim and provide a written response to the Contractor within 30 days of its receipt unless otherwise specified. The Engineer's receipt of the full and final documentation of potential claim shall be evidenced by postal receipt or the Engineer's written receipt if delivered by hand. If the full and final documentation of potential claim is submitted by the Contractor after acceptance of the work by the Director, the Engineer need not provide a written response.

Provisions in this section shall not apply to those claims for overhead costs and administrative disputes that occur after issuance of the proposed final estimate. Administrative disputes are disputes of administrative deductions or withholds, contract item quantities, contract item adjustments, interest payments, protests of contract change orders as provided in Section 4-1.03A, "Procedure and Protest," and protests of the Weekly Statement of Working Days as provided in Section 8-1.06, "Time of Completion." Administrative disputes that occur prior to issuance of the proposed final estimate shall follow applicable requirements of this section. Information listed in the

supplemental notice and full and final documentation of potential claim that is not applicable to the administrative dispute may be exempted as determined by the Engineer.

Unless otherwise specified in the special provisions, the Contractor may pursue the administrative claim process pursuant to Section 9-1.07B, "Final Payment and Claims," for any potential claim found by the Engineer to be without merit.

Failure of the Contractor to conform to specified dispute procedures shall constitute a failure to pursue diligently and exhaust the administrative procedures in the contract, and is deemed as the Contractor's waiver of the potential claim and a waiver of the right to a corresponding claim for the disputed work in the administrative claim process in conformance with Section 9-1.07B, "Final Payment of Claims," and shall operate as a bar to arbitration pursuant to Section 10240.2 of the California Public Contract Code.

**Replace Section 9-1.05 with:**

**9-1.05 STOP NOTICE WITHHOLDS**

The Department may withhold payments to cover claims filed under Civ Code § 3179 et seq.

Stop notice information may be obtained from the Office of External Accounts Payable, Division of Accounting.

**Add:**

**9-1.053 PERFORMANCE FAILURE WITHHOLDS**

During each estimate period you fail to comply with a contract part, including submittal of a document as specified, the Department withholds a part of the progress payment. The documents include quality control plans, schedules, traffic control plans, and water pollution control submittals.

For 1 performance failure, the Department withholds 25 percent of the progress payment but does not withhold more than 10 percent of the total bid.

For multiple performance failures, the Department withholds 100 percent of the progress payment but does not withhold more than 10 percent of the total bid.

The Department returns performance-failure withholds in the progress payment following the correction of noncompliance.

**Add:**

**9-1.055 PENALTY WITHHOLDS**

Penalties include fines and damages that are proposed, assessed, or levied against you or the Department by a governmental agency or citizen lawsuit. Penalties are also payments made or costs incurred in settling alleged permit violations of Federal, State, or local laws, regulations, or requirements. The cost incurred may include the amount spent for mitigation or correcting a violation.

If you or the Department is assessed a penalty, the Department may withhold the penalty amount until the penalty disposition has been resolved. The Department may withhold penalty funds and notify you within 15 days of the withhold. If the penalty amount is less than the amount being withheld from progress payments for retentions, the Department will not withhold the penalty amount.

If the penalty is resolved for less than the amount withheld, the Department pays interest at a rate of 6 percent per year on the excess withhold. If the penalty is not resolved, the withhold becomes a deduction.

Instead of the withhold, you may provide a bond payable to the Department of Transportation equal to the highest estimated liability for any disputed penalties proposed.

**Add:**

**9-1.057 PROGRESS WITHHOLDS**

The Department withholds 10 percent of a partial payment for noncompliant progress. Noncompliant progress occurs when:

1. Total days to date exceed 75 percent of the revised contract working days
2. Percent of working days elapsed exceeds the percent of value of work completed by more than 15 percent



The Engineer determines the percent of working days elapsed by dividing the total days to date by the revised contract working days and converting the quotient to a percentage.

The Engineer determines the percent of value of work completed by summing payments made to date and the amount due on the current progress estimate, dividing this sum by the current total estimated value of the work, and converting the quotient to a percentage. These amounts are shown on the Progress Payment Voucher.

When the percent of working days elapsed minus the percent of value of work completed is less than or equal to 15 percent, the Department returns the withhold in the next progress payment.

**In Section 9-1.06 in the 4th paragraph, replace the 1st sentence with:**

The Department shall pay monthly to the Contractor, while carrying on the work, the balance not retained, as aforesaid, after deducting therefrom all previous payments and all sums to be deducted or withheld under the provisions of the contract.

**In Section 9-1.065 replace the title and the 1st and 2nd paragraphs with:**

**9-1.065 RELEASE OF RETAINED FUNDS**

The Department releases retained funds if you:

1. Request release of the retention (Pub Cont Code § 10263) in writing
2. Deposit securities equivalent to the funds you want released into escrow with the State Treasurer or with a bank acceptable to the Department
3. Are the beneficial owner of and receive interest on the deposited securities substituted for the retained funds

**In Section 9-1.07A replace the 2nd sentence with:**

The Department pays the balance due less previous payments, deductions, withholds, and retentions under the provisions of the contract and those further amounts that the Engineer determines to be necessary pending issuance of the proposed final estimate and payment thereon.

**Replace Section 9-1.07B with:**

**9-1.07B Final Payment and Claims**

After acceptance by the Director, the Engineer makes a proposed final estimate of the total amount payable to the Contractor, including an itemization of the total amount, segregated by contract item quantities, extra work, and other basis for payment, and shows each deduction made or to be made for prior payments and amounts to be deducted, withheld, or retained under the provisions of the contract. Prior estimates and payments are subject to correction in the proposed final estimate. The Contractor must submit written approval of the proposed final estimate or a written statement of claims arising under or by virtue of the contract so that the Engineer receives the written approval or statement of claims no later than close of business of the 30th day after receiving the proposed final estimate. The Contractor's receipt of the proposed final estimate must be evidenced by postal receipt. The Engineer's receipt of the Contractor's written approval or statement of claims must be evidenced by postal receipt or the Engineer's written receipt if delivered by hand.

On the Contractor's approval, or if the Contractor files no claim within the specified period of 30 days, the Engineer will issue a final estimate in writing in conformance with the proposed final estimate submitted to the Contractor, and within 30 days thereafter the State will pay the entire sum so found to be due. That final estimate and payment thereon shall be conclusive and binding against both parties to the contract on all questions relating to the amount of work done and the compensation payable therefor, except as otherwise provided in Sections 9-1.03C, "Records," and 9-1.09, "Clerical Errors."

If the Contractor within the specified period of 30 days files claims, the Engineer will issue a semifinal estimate in conformance with the proposed final estimate submitted to the Contractor and within 30 days thereafter the State will pay the sum found to be due. The semifinal estimate and corresponding payment shall be conclusive and binding against both parties to the contract on each question relating to the amount of work done and the compensation payable therefor, except insofar as affected by the claims filed within the time and in the manner required hereunder and except as otherwise provided in Sections 9-1.03C, "Records," and 9-1.09, "Clerical Errors."

Except for claims for overhead costs and administrative disputes that occur after issuance of the proposed final estimate, the Contractor shall only provide the following two items of information for each claim:

1. The exclusive identification number that corresponds to the supporting full and final documentation of potential claim
2. The final amount of requested additional compensation

If the final amount of requested additional compensation is different than the amount of requested compensation included in the full and final documentation of potential claim, the Contractor shall provide in the written statement of claims the reasons for the changed amount, the specific provisions of the contract which support the changed amount, and a statement of the reasons the provisions support and provide a basis for the changed amount. If the Contractor's claim fails to provide an exclusive identification number or if there is a disparity in the provided exclusive identification number, the Engineer will notify the Contractor of the omission or disparity. The Contractor shall have 15 days after receiving notification from the Engineer to correct the omission or disparity. If after the 15 days has elapsed, there is still an omission or disparity of the exclusive identification number assigned to the claim, the Engineer will assign the number. No claim will be considered that has any of the following deficiencies:

1. The claim does not have the same nature, circumstances, and basis as the corresponding full and final documentation of potential claim.
2. The claim does not have a corresponding full and final documentation of potential claim.
3. The claim was not included in the written statement of claims.
4. The Contractor did not comply with applicable notice or protest requirements of Sections 4-1.03, "Changes," 5-1.116, "Differing Site Condition," 8-1.06, "Time of Completion," 8-1.07, "Liquidated Damages," 8-1.10, "Utility and Non-Highway Facilities," and 9-1.04, "Notice of Potential Claim."

Administrative disputes that occur after issuance of the proposed final estimate shall be included in the Contractor's written statement of claims in sufficient detail to enable the Engineer to ascertain the basis and amounts of those claims.

The Contractor shall keep full and complete records of the costs and additional time incurred for work for which a claim for additional compensation is made. The Engineer or designated claim investigators or auditors shall have access to those records and any other records as may be required by the Engineer to determine the facts or contentions involved in the claims. Failure to permit access to those records shall be sufficient cause for denying the claims.

The written statement of claims submitted by the Contractor shall be accompanied by a notarized certificate containing the following language:

Under the penalty of law for perjury or falsification and with specific reference to the California False Claims Act, Government Code Section 12650 et. seq., the undersigned,

\_\_\_\_\_  
(name)

\_\_\_\_\_  
(title)

\_\_\_\_\_  
(company)

hereby certifies that the claim for the additional compensation and time, if any, made herein for the work on this contract is a true statement of the actual costs incurred and time sought, and is fully documented and supported under the contract between parties.

Dated \_\_\_\_\_

/s/ \_\_\_\_\_

Subscribed and sworn before me this \_\_\_\_\_ day

of \_\_\_\_\_ .

\_\_\_\_\_  
(Notary Public)

My Commission

Expires \_\_\_\_\_

Failure to submit the notarized certificate will be sufficient cause for denying the claim.

Any claim for overhead, in addition to being certified as stated above, shall be supported and accompanied by an audit report of an independent Certified Public Accountant. Omission of a supporting audit report of an independent Certified Public Accountant shall result in denial of the claim and shall operate as a bar to arbitration, as to the claim, in conformance with the requirements in Section 10240.2 of the California Public Contract Code. Any claim for overhead shall be subject to audit by the State at its discretion. The costs of performing an audit examination and submitting the report shall be borne by the Contractor. The Department will deduct an offset amount for field and home office overhead paid on all added work from any claim for overhead as appropriate, as determined by the Department. The value of the added work equals the value of the work completed minus the total bid. The home office overhead offset equals 5 percent of the added work. The field office overhead offset equals 5-1/2 percent of the added work. The Certified Public Accountant's audit examination shall be performed in conformance with the requirements of the American Institute of Certified Public Accountants Attestation Standards. The audit examination and report shall depict the Contractor's project and company-wide financial records and shall specify the actual overall average daily rates for both field and home office overhead for the entire duration of the project, and whether the costs have been properly allocated. The rates of field and home office overhead shall exclude unallowable costs as determined in Title 48 of the Federal Acquisition Regulations, Chapter 1, Part 31. The audit examination and report shall determine if the rates of field and home office overhead are:

1. Allowable in conformance with the requirements in Title 48 of the Federal Acquisition Regulations, Chapter 1, Part 31.
2. Adequately supported by reliable documentation.
3. Related solely to the project under examination.

Costs or expenses incurred by the State in reviewing or auditing claims that are not supported by the Contractor's cost accounting or other records shall be deemed to be damages incurred by the State within the meaning of the California False Claims Act.

If the Engineer determines that a claim requires additional analysis, the Engineer will schedule a board of review meeting. The Contractor shall meet with the review board or person and make a presentation in support of the claim. Attendance by the Contractor at the board of review meeting shall be mandatory.

The District Director of the District that administered the contract will make the final determination of any claims which remain in dispute after completion of claim review by the Engineer or board of review meeting.

The final determination of claims will be sent to the Contractor by hand delivery or deposit in the U.S. mail. The Engineer will then make and issue the Engineer's final estimate in writing and within 30 days thereafter the

Failure of the Contractor to conform to the specified dispute procedures shall constitute a failure to pursue diligently and exhaust the administrative procedures in the contract and shall operate as a bar to arbitration in conformance with the requirements in Section 10240.2 of the California Public Contract Code.

## SECTION 12 CONSTRUCTION AREA TRAFFIC CONTROL DEVICES

(Issued 10-06-06)

Attention is directed to Part 6 of the California MUTCD. Nothing in this Section 12 is to be construed as to reduce the minimum standards in these manuals.

## 12-2.01 FLAGGERS

**In Section 12-3.01 replace the 1st paragraph with:**

In addition to the requirements in Part 6 of the California MUTCD, all devices used by the Contractor in the performance of the work shall conform to the provisions in this Section 12-3.

Retroreflective sheeting shall conform to the requirements in ASTM Designation: D 4956 and to the special provisions.

The term "Construction Area Signs" shall include all temporary signs required for the direction of public traffic through or around the work during construction. Construction area signs are shown in or referred to in Part 6 of the California MUTCD.

All construction area signs shall conform to the dimensions, color and legend requirements of the plans, Part 6 of the California MUTCD and these specifications. All sign panels shall be the product of a commercial sign manufacturer, and shall be as specified in these specifications.

Used signs with the specified sheeting material will be considered satisfactory if they conform to the requirements for visibility and legibility and the colors conform to the requirements in Part 6 of the California MUTCD. A significant difference between day and nighttime retroreflective color will be grounds for rejecting signs.



Cementitious material shall conform to the provisions in Section 90-2.01, "Cementitious Materials." Supplementary cementitious material will not be required.

The aggregate, cementitious material, and water shall be proportioned either by mass or by volume. Slurry cement backfill shall contain not less than 110 kg of cementitious material per cubic meter. The water content shall be sufficient to produce a fluid, workable mix that will flow and can be pumped without segregation of the aggregate while being placed.

Physical/Chemical Requirements		
Property	Test Method	Requirement
pH	*TMECC 04.11-A, Elastometric pH 1:5 Slurry Method, pH Units	6.0–8.0
Soluble Salts	TMECC 04.10-A, Electrical Conductivity 1:5 Slurry Method dS/m (mmhos/cm)	0-10.0
Moisture Content	TMECC 03.09-A, Total Solids & Moisture at 70+/- 5 deg C, % Wet Weight Basis	30–60
Organic Matter Content	TMECC 05.07-A, Loss-On-Ignition Organic Matter Method (LOI), % Dry Weight Basis	30–65
Maturity	TMECC 05.05-A, Germination and Vigor Seed Emergence Seedling Vigor % Relative to Positive Control	80 or Above 80 or Above
Stability	TMECC 05.08-B, Carbon Dioxide Evolution Rate mg CO <sub>2</sub> -C/g OM per day	8 or below
Particle Size	TMECC 02.02-B Sample Sieving for Aggregate Size Classification % Dry Weight Basis	95% Passing 5/8 inch 70% Passing 3/8 inch
Pathogen	TMECC 07.01-B, Fecal Coliform Bacteria < 1000 MPN/gram dry wt.	Pass
Pathogen	TMECC 07.01-B, Salmonella < 3 MPN/4 grams dry wt.	Pass
Physical Contaminants	TMECC 02.02-C, Man Made Inert Removal and Classification: Plastic, Glass and Metal, % > 4mm fraction	Combined Total: < 1.0
Physical Contaminants	TMECC 02.02-C, Man Made Inert Removal and Classification: Sharps (Sewing needles, straight pins and hypodermic needles), % > 4mm fraction	None Detected

\*TMECC refers to "Test Methods for the Examination of Composting and Compost," published by the United States Department of Agriculture and the United States Compost Council (USCC).

Prior to application, the Contractor shall provide the Engineer with a copy of the soil amendment producer's Compost Technical Data Sheet and a copy of the compost producers STA certification. The Compost Technical Data Sheet shall include laboratory analytical test results, directions for product use, and a list of product ingredients.

Prior to application, the Contractor shall provide the Engineer with a Certificate of Compliance in conformance with the provisions in Section 6-1.07, "Certificates of Compliance," of the Standard Specifications.

**In Section 20-2.10 delete the 8th, 9th, and 10th paragraphs.**

**Replace Section 20-2.25 with:**

#### **20-2.25 BACKFLOW PREVENTERS**

Backflow preventers shall be one of the reduced pressure principle devices as specified in these specifications and the special provisions.

Backflow preventers shall be factory assembled and shall include 2 check valves, one pressure differential relief valve, 2 shut-off valves and 4 test cocks. Backflow preventer and valves shall be the same size as the pipeline in which they are installed, unless otherwise shown on the plans.

Backflow preventer shut-off valves shall be manufactured from iron or bronze and shall be either resilient wedged gate valves, resilient seated and fully ported ball valves, or resilient seated butterfly valves. Threaded type shut-off valves shall be provided with a union on one side of each valve. Unions shall be brass or malleable iron.

**In Section 20-3.04A delete the last paragraph.**

## 20-4.055 PRUNING

**Replace Section 20-5.03J with:**

Backflow preventers shall be checked and tested for proper operation by a certified Backflow Preventer Tester. The tester shall hold a valid certification as a Backflow Preventer Tester from the local governing authority in which the device to be tested is located. The local governing authority shall be the county, city or water purveyor having the governing authority over testing of backflow preventers involved. If the local governing authority does not have a certification program for Backflow Preventer Testers, the tester shall have a certificate from one of the following:

- Backflow preventers, installed by the Contractor, failing required tests shall be repaired at the Contractor's expense.

[illegible]

**(Issued 02-16-07)**

1. Broken stone
2. Crushed gravel
3. Natural rough surfaced gravel
4. Sand
5. Up to 100 percent of any combination of processed:

- Contract No. 04-0120T4  
80 of 220



5. Up to 100 percent of any combination of processed:

- 5.1. Asphalt concrete
- 5.2. Portland cement concrete
- 5.3. Lean concrete base
- 5.4. Cement treated base

^^

## **SECTION 26 AGGREGATE BASE**

**(Issued 02-16-07)**

### **In Section 26-1.02A replace the 1st paragraph with:**

Aggregate must be clean and free from organic matter and other deleterious substances. Aggregate must consist of any combination of:

1. Broken stone
2. Crushed gravel
3. Natural rough surfaced gravel
4. Sand
5. Up to 100 percent of any combination of processed:
  - 5.1. Asphalt concrete
  - 5.2. Portland cement concrete
  - 5.3. Lean concrete base
  - 5.4. Cement treated base

### **In Section 26-1.02B replace the 1st paragraph with:**

Aggregate must be clean and free from organic matter and other deleterious substances. Aggregate must consist of any combination of:

1. Broken stone
2. Crushed gravel
3. Natural rough surfaced gravel
4. Sand
5. Up to 100 percent of any combination of processed:
  - 5.1. Asphalt concrete
  - 5.2. Portland cement concrete
  - 5.3. Lean concrete base
  - 5.4. Cement treated base

^^

## **SECTION 27 CEMENT TREATED BASES**

**(Issued 07-31-07)**

### **In Section 27-1.02 replace the 1st paragraph with:**

Cement shall be Type II portland cement conforming to the provisions in Section 90-2.01A, "Cement."

**In Section 27-1.02 replace the 3rd and 4th paragraphs with:**

Aggregate for use in Class A cement treated base shall be of such quality that when mixed with cement in an amount not to exceed 5 percent by mass of the dry aggregate and compacted at optimum moisture content, the compressive strength of a sample of the compacted mixture shall not be less than 5.2 MPa at 7 days, when tested by California Test 312.

Aggregate for use in Class B cement treated base shall have a Resistance (R-value) of not less than 60 before mixing with cement and a Resistance (R-value) of not less than 80 after mixing with cement in an amount not to exceed 2.5 percent by mass of the dry aggregate.

**In Section 27-1.07 replace the 9th paragraph with:**

When surfacing material is hot mix asphalt, the low areas shall be filled with hot mix asphalt conforming to the requirements for the lowest layer of hot mix asphalt to be placed as surfacing. This filling shall be done as a separate operation prior to placing the lowest layer of surfacing, and full compensation for this filling will be considered as included in the contract price paid for cement treated base and no additional compensation will be allowed therefor.

^^

**SECTION 28 LEAN CONCRETE BASE  
(Issued 07-31-07)**

**In Section 28-1.02 replace the 1st paragraph with:**

Cement shall be Type II portland cement conforming to the provisions in Section 90-2.01A, "Cement."

**In Section 28-1.02 replace the 6th paragraph with:**

Aggregate shall be of such quality that, when mixed with cement in an amount not to exceed 180 kg per cubic meter, and tested in conformance with the requirements in California Test 548, the compressive strength of a sample will be not less than 5.0 MPa at 7 days.

**In Section 28-1.06 replace the 2nd paragraph with:**

In advance of curing operations, lean concrete base to be surfaced with hot mix asphalt shall be textured with a drag strip of burlap, a broom or a spring steel tine device which will produce scoring in the finished surface. The scoring shall be parallel with the centerline or transverse thereto. The operation shall be performed at a time and in a manner to produce the coarsest texture practical for the method used.

**In Section 28-1.08 replace the 2nd paragraph with:**

Hardened lean concrete base with a surface lower than 15 mm below the grade established by the Engineer shall be removed and replaced with lean concrete base which complies with these specifications, or if permitted by the Engineer, the low areas shall be filled with pavement material as follows:

1. When pavement material is hot mix asphalt, the low areas shall be filled with hot mix asphalt conforming to the requirements for the lowest layer of hot mix asphalt to be placed as pavement. This shall be done as a separate operation prior to placing the lowest layer of pavement, and full compensation for this filling will be considered as included in the contract price paid per cubic meter for lean concrete base and no additional compensation will be allowed therefor.
2. When pavement material is portland cement concrete, the low areas shall be filled with pavement concrete at the time and in the same operation that the pavement is placed. Full compensation for this filling will be considered as included in the contract price paid per cubic meter for lean concrete base and no additional compensation will be allowed therefor.



2. When pavement material is portland cement concrete, the low areas shall be filled with pavement concrete at the time and in the same operation in which the pavement is placed.
3. Full compensation for filling low areas will be considered as included in the contract price paid per cubic meter for treated permeable base and no additional compensation will be allowed therefor.

^^

## **SECTION 37 BITUMINOUS SEALS**

**(Issued 08-17-07)**

### **In Section 37-1.03 replace the 4th, 5th, and 6th paragraphs with:**

On 2-lane two-way roadways, W8-7 "LOOSE GRAVEL" signs and W13-1 (35) speed advisory signs shall be furnished and placed adjacent to both sides of the traveled way where screenings are being spread on a traffic lane. The first W8-7 sign in each direction shall be placed where traffic first encounters loose screenings, regardless of which lane the screenings are being spread on. The W13-1 (35) signs need not be placed in those areas with posted speed limits of less than 40 MPH. The signs shall be placed at maximum 600-m intervals along each side of the traveled way and at public roads or streets entering the seal coat area as directed by the Engineer.

On multilane roadways (freeways, expressways and multilane conventional highways) where screenings are being spread on a traffic lane, W8-7 "LOOSE GRAVEL" signs and W13-1 (35) speed advisory signs shall be furnished and placed adjacent to the outside edge of the traveled way nearest to the lane being worked on. The first W8-7 sign shall be placed where the screenings begin with respect to the direction of travel on that lane. The W13-1 (35) signs need not be placed in those areas with posted speed limits of less than 40 MPH. The signs shall be placed at maximum 600-m intervals along the edge of traveled way and at on-ramps, public roads or streets entering the seal coat area as directed by the Engineer.

The W8-7 and W13-1 signs shall be maintained in place at each location until final brooming of the seal coat surface at that location is completed. The W8-7 and W13-1 signs shall conform to the provisions for construction area signs in Section 12, "Construction Area Traffic Control Devices." The signs may be set on temporary portable supports with the W13-1 below the W8-7 or on barricades with the W13-1 sign alternating with the W8-7 sign.

### **In Section 37-1.07 replace the 2nd paragraph with:**

Rollers shall be oscillating type pneumatic-tired rollers. A minimum of 2 pneumatic-tired rollers conforming to the provisions in Section 39-3.03 "Spreading and Compacting Equipment," shall be furnished.

### **In Section 37-1.09 replace the 2nd paragraph with:**

The above prices and payments shall include full compensation for furnishing all labor, materials, tools, equipment and incidentals, and for doing all the work involved in applying seal coat, complete in place, including furnishing, placing, maintaining, and removing W8-7 and W13-1 signs, when required, and temporary supports or barricades for the signs, as shown on the plans, and as specified in these specifications and the special provisions, and as directed by the Engineer.

^^

## **SECTION 39 ASPHALT CONCRETE**

**(Issued 06-05-09)**

### **Replace Section 39 with:**

## **SECTION 39 HOT MIX ASPHALT**

### **39-1 GENERAL**

### **39-1.01 DESCRIPTION**

Section 39 includes specifications for producing and placing hot mix asphalt (HMA) by mixing aggregate and asphalt binder at a mixing plant and spreading and compacting the HMA mixture.

The special provisions specify one or more type of HMA, including:

1. Type A
2. Type B
3. Open graded friction course (OGFC). OGFC includes hot mix asphalt (open graded), rubberized hot mix asphalt (open graded) (RHMA-O) and rubberized hot mix asphalt (open graded high binder) (RHMA-O-HB)
4. Rubberized hot mix asphalt (gap graded) (RHMA-G)

The special provisions specify the HMA construction process, including:

1. Standard
2. Method
3. Quality Control / Quality Assurance (QC / QA)

### **39-1.02 MATERIALS**

#### **39-1.02A Geosynthetic Pavement Interlayer**

Geosynthetic pavement interlayer must comply with the specifications for pavement reinforcing fabric in Section 88, "Engineering Fabrics."

#### **39-1.02B Tack Coat**

Tack coat must comply with the specifications for asphaltic emulsion in Section 94, "Asphaltic Emulsion," or asphalt binder in Section 92, "Asphalts." Choose the type and grade.

Notify the Engineer if you dilute asphaltic emulsion with water. The mass ratio of added water to asphaltic emulsion must not exceed 1 to 1.

Measure added water either by mass or volume in compliance with the specifications for weighing, measuring, and metering devices under Section 9-1.01, "Measurement of Quantities," or you may use water meters from water districts, cities, or counties. If you measure water by volume, apply a conversion factor to determine the correct mass.

With each dilution, submit in writing:

1. The mass ratio of water to bituminous material in the original asphaltic emulsion
2. The mass of asphaltic emulsion before diluting
3. The mass of added water
4. The final dilution mass ratio of water to asphaltic emulsion

#### **39-1.02C Asphalt Binder**

Asphalt binder in HMA must comply with Section 92, "Asphalts," or Section 39-1.02D, "Asphalt Rubber Binder." The special provisions specify the grade.

Asphalt binder for geosynthetic pavement interlayer must comply with Section 92, "Asphalts." Choose from Grades PG 64-10, PG 64-16, or PG 70-10.

#### **39-1.02D Asphalt Rubber Binder**

##### **General**

Use asphalt rubber binder in RHMA-G, RHMA-O, and RHMA-O-HB. Asphalt rubber binder must be a combination of:

1. Asphalt binder
2. Asphalt modifier
3. Crumb rubber modifier (CRM)

The combined asphalt binder and asphalt modifier must be  $80.0 \pm 2.0$  percent by mass of the asphalt rubber binder.

### Asphalt Modifier

Asphalt modifier must be a resinous, high flash point, and aromatic hydrocarbon, and comply with:

#### Asphalt Modifier for Asphalt Rubber Binder

Quality Characteristic	ASTM	Specification
Viscosity, m <sup>2</sup> /s (x 10 <sup>-6</sup> ) at 100 °C	D 445	X ± 3 <sup>a</sup>
Flash Point, CL.O.C., °C	D 92	207 minimum
Molecular Analysis		
Asphaltenes, percent by mass	D 2007	0.1 maximum
Aromatics, percent by mass	D 2007	55 minimum

Note:

<sup>a</sup> The symbol "X" is the proposed asphalt modifier viscosity. "X" must be between 19 and 36. A change in "X" requires a new asphalt rubber binder design.

Asphalt modifier must be from 2.0 percent to 6.0 percent by mass of the asphalt binder in the asphalt rubber binder.

### Crumb Rubber Modifier

CRM consists of a ground or granulated combination of scrap tire CRM and high natural CRM. CRM must be 75.0 ± 2.0 percent scrap tire CRM and 25.0 ± 2.0 percent high natural CRM by total mass of CRM. Scrap tire CRM must be from any combination of automobile tires, truck tires, or tire buffings.

Sample and test scrap tire CRM and high natural CRM separately. CRM must comply with:

#### Crumb Rubber Modifier for Asphalt Rubber Binder

Quality Characteristic	Test Method	Specification
Scrap tire CRM gradation (% passing 2.36-mm sieve)	LP-10	100
High natural CRM gradation (% passing 2.00-mm sieve)	LP-10	100
Wire in CRM (% max.)	LP-10	0.01
Fabric in CRM (% max.)	LP-10	0.05
CRM particle length (mm max.) <sup>a</sup>	--	4.75
CRM specific gravity <sup>a</sup>	CT 208	1.1 – 1.2
Natural rubber content in high natural CRM (%) <sup>a</sup>	ASTM D 297	40.0 – 48.0

Note:

<sup>a</sup> Test at mix design and for Certificate of Compliance.

Only use CRM ground and granulated at ambient temperature. If steel and fiber are cryogenically separated, it must occur before grinding and granulating. Only use cryogenically produced CRM particles that can be ground or granulated and not pass through the grinder or granulator.

CRM must be dry, free-flowing particles that do not stick together. CRM must not cause foaming when combined with the asphalt binder and asphalt modifier. You may add calcium carbonate or talc up to 3 percent by mass of CRM.

### Asphalt Rubber Binder Design and Profile

Submit in writing an asphalt rubber binder design and profile that complies with the asphalt rubber binder specifications. In the design, designate the asphalt, asphalt modifier, and CRM and their proportions. The profile must include the same component sources for the asphalt rubber binder used.

Design the asphalt rubber binder from testing you perform for each quality characteristic and for the reaction temperatures expected during production. The 24-hour (1,440-minute) interaction period determines the design profile. At a minimum, mix asphalt rubber binder components, take samples, and perform and record the following tests:

#### Asphalt Rubber Binder Reaction Design Profile

Test	Minutes of Reaction <sup>a</sup>							Limits
	45	60	90	120	240	360	1440	

Cone penetration @ 77 °F, 0.10 mm (ASTM D 217)	X <sup>b</sup>				X		X	25 - 70
Resilience @ 77 °F, percent rebound (ASTM D 5329)	X				X		X	18 min.
Field softening point, °F (ASTM D 36)	X				X		X	125 - 165
Viscosity, centipoises (LP-11)	X	X	X	X	X	X	X	1,500 - 4,000

Notes:

<sup>a</sup> Six hours (360 minutes) after CRM addition, reduce the oven temperature to 135 °C for a period of 16 hours. After the 16-hour (1320 minutes) cool-down after CRM addition, reheat the binder to the reaction temperature expected during production for sampling and testing at 24 hours (1440 minutes).

<sup>b</sup> "X" denotes required testing

### Asphalt Rubber Binder

After interacting for a minimum of 45 minutes, asphalt rubber binder must comply with:

#### Asphalt Rubber Binder

Quality Characteristic	Test for Quality Control or Acceptance	Test Method	Specification	
			Minimum	Maximum
Cone penetration @ 77 °F, 0.10 mm	Acceptance	ASTM D 217	25	70
Resilience @ 77 °F, percent rebound	Acceptance	ASTM D 5329	18	--
Field softening point, °F	Acceptance	ASTM D 36	125	165
Viscosity @ 177 °C, centipoises	Quality Control	LP-11	1,500	4,000

### 39-1.02E Aggregate

Aggregate must be clean and free from deleterious substances. Aggregate:

1. Retained on the 4.75-millimeter sieve is coarse
2. Passing the 4.75-millimeter sieve is fine
3. Added and passing the 0.6-millimeter sieve is supplemental fine, including:
  - 3.1. Hydrated lime
  - 3.2. Portland cement
  - 3.3. Fines from dust collectors

The special provisions specify the aggregate gradation for each HMA type.

The specified aggregate gradation is before the addition of asphalt binder and includes supplemental fines. The Engineer tests for aggregate grading under California Test 202, modified by California Test 105 if there is a difference in specific gravity of 0.2 or more between the coarse and fine parts of different aggregate blends.

Choose a sieve size target value (TV) within each target value limit presented in the aggregate gradation tables.

**Aggregate Gradation  
(Percentage Passing)  
HMA Types A and B**

19-mm HMA Types A and B

Sieve Sizes	Target Value Limits	Allowable Tolerance
25-mm	100	—
19-mm	90 - 100	TV $\pm$ 5
12.5-mm	70 - 90	TV $\pm$ 6
4.75-mm	45 - 55	TV $\pm$ 7
2.36-mm	32 - 40	TV $\pm$ 5
0.6-mm	12 - 21	TV $\pm$ 4
0.075-mm	2 - 7	TV $\pm$ 2

12.5-mm HMA Types A and B

Sieve Sizes	Target Value Limits	Allowable Tolerance
19-mm	100	—
12.5-mm	95 - 99	TV $\pm$ 6
9.5-mm	75 - 95	TV $\pm$ 6
4.75-mm	55 - 66	TV $\pm$ 7
2.36-mm	38 - 49	TV $\pm$ 5
0.6-mm	15 - 27	TV $\pm$ 4
0.075-mm	2 - 8	TV $\pm$ 2

9.5-mm HMA Types A and B

Sieve Sizes	Target Value Limits	Allowable Tolerance
12.5-mm	100	—
9.5-mm	95 - 100	TV $\pm$ 6
4.75-mm	58 - 72	TV $\pm$ 7
2.36-mm	34 - 48	TV $\pm$ 6
0.6-mm	18 - 32	TV $\pm$ 5
0.075-mm	2 - 9	TV $\pm$ 2

4.75-mm HMA Types A and B

Sieve Sizes	Target Value Limits	Allowable Tolerance
9.5-mm	100	—
4.75-mm	95 - 100	TV $\pm$ 7
2.36-mm	72 - 77	TV $\pm$ 7
0.6-mm	37 - 43	TV $\pm$ 7
0.075-mm	2 - 12	TV $\pm$ 4



### Rubberized Hot Mix Asphalt - Gap Graded (RHMA-G)

19-mm RHMA-G		
Sieve Sizes	Target Value Limits	Allowable Tolerance
25-mm	100	—
19-mm	95 - 100	TV $\pm 5$
12.5-mm	83 - 87	TV $\pm 6$
9.5-mm	65 - 70	TV $\pm 6$
4.75-mm	28 - 42	TV $\pm 7$
2.36-mm	14 - 22	TV $\pm 5$
0.075-mm	0 - 6	TV $\pm 2$

12.5-mm RHMA-G		
Sieve Sizes	Target Value Limits	Allowable Tolerance
19-mm	100	—
12.5-mm	90 - 100	TV $\pm 6$
9.5-mm	83 - 87	TV $\pm 6$
4.75-mm	28 - 42	TV $\pm 7$
2.36-mm	14 - 22	TV $\pm 5$
0.075-mm	0 - 6	TV $\pm 2$

### Open Graded Friction Course (OGFC)

25-mm OGFC		
Sieve Sizes	Target Value Limits	Allowable Tolerance
37.5-mm	100	—
25-mm	99 - 100	TV $\pm 5$
19-mm	85 - 96	TV $\pm 5$
12.5-mm	55 - 71	TV $\pm 6$
4.75-mm	10 - 25	TV $\pm 7$
2.36-mm	6 - 16	TV $\pm 5$
0.075-mm	1 - 6	TV $\pm 2$

12.5-mm OGFC		
Sieve Sizes	Target Value Limits	Allowable Tolerance
19-mm	100	—
12.5-mm	95 - 100	TV $\pm 6$
9.5-mm	78 - 89	TV $\pm 6$
4.75-mm	28 - 37	TV $\pm 7$
2.36-mm	7 - 18	TV $\pm 5$
0.6-mm	0 - 10	TV $\pm 4$
0.075-mm	0 - 3	TV $\pm 2$

9.5-mm OGFC		
Sieve Sizes	Target Value Limits	Allowable Tolerance
12.5-mm	100	—
9.5-mm	90 - 100	TV $\pm 6$
4.75-mm	29 - 36	TV $\pm 7$
2.36-mm	7 - 18	TV $\pm 6$
0.6-mm	0 - 10	TV $\pm 5$
0.075-mm	0 - 3	TV $\pm 2$

Before the addition of asphalt binder and lime treatment, aggregate must comply with:

Aggregate Quality					
Quality Characteristic	Test Method	HMA Type			
		A	B	RHMA-G	OGFC
Percent of crushed particles	CT 205				
Coarse aggregate (% min.)					
One fractured face		90	25	--	90
Two fractured faces		75	--	90	75
Fine aggregate (% min.)					
(Passing 4.75-mm sieve					
and retained on 2.36-mm sieve.)					
One fractured face		70	20	70	90
Los Angeles Rattler (% max.)	CT 211				
Loss at 100 Rev.		12	--	12	12
Loss at 500 Rev.		45	50	40	40
Sand equivalent (min.) <sup>a</sup>	CT 217	47	42	47	--
Fine aggregate angularity (% min.) <sup>b</sup>	AASHTO T 304 Method A	45	45	45	--
Flat and elongated particles (% max. by mass @ 5:1)	ASTM D 4791	10	10	10	10

Notes:

<sup>a</sup> Reported value must be the average of 3 tests from a single sample.

<sup>b</sup> The Engineer waives this specification if HMA contains less than 10 percent of nonmanufactured sand by mass of total aggregate. Manufactured sand is fine aggregate produced by crushing rock or gravel.

### 39-1.02F Reclaimed Asphalt Pavement

You may produce HMA using reclaimed asphalt pavement (RAP). HMA produced using RAP must comply with the specifications for HMA except aggregate quality specifications do not apply to RAP. You may substitute RAP aggregate for a part of the virgin aggregate in HMA in a quantity not exceeding 15.0 percent of the aggregate blend. Do not use RAP in OGFC and RHMA-G.

Assign the substitution rate of RAP aggregate for virgin aggregate with the job mix formula (JMF) submittal. The JMF must include the percent of RAP used. If you change your assigned RAP aggregate substitution rate by more than 5 percent (within the 15.0 percent limit), submit a new JMF.

Process RAP from asphalt concrete. You may process and stockpile RAP throughout the project's life. Prevent material contamination and segregation. Store RAP in stockpiles on smooth surfaces free of debris and organic material. Processed RAP stockpiles must consist only of homogeneous RAP.

### 39-1.03 HOT MIX ASPHALT MIX DESIGN REQUIREMENTS

#### 39-1.03A General

A mix design consists of performing California Test 367 and laboratory procedures on combinations of aggregate gradations and asphalt binder contents to determine the optimum binder content (OBC) and HMA mixture qualities. If RAP is used, use Laboratory Procedure LP-9. The result of the mix design becomes the proposed JMF.

Use Form CEM-3512 to document aggregate quality and mix design data. Use Form CEM-3511 to present the JMF.

Laboratories testing aggregate qualities and preparing the mix design and JMF must be qualified under the Department's Independent Assurance Program. Take samples under California Test 125.

The Engineer reviews the aggregate qualities, mix design, and JMF and verifies and accepts the JMF.

You may change the JMF during production. Do not use the changed JMF until the Engineer accepts it. Except when adjusting the JMF in compliance with Section 39-1.03E, "Job Mix Formula Verification," perform a new mix design and submit in writing a new JMF submittal for changing any of the following:

1. Target asphalt binder percentage
2. Asphalt binder supplier
3. Asphalt rubber binder supplier
4. Component materials used in asphalt rubber binder or percentage of any component materials
5. Combined aggregate gradation
6. Aggregate sources
7. Substitution rate for RAP aggregate of more than 5 percent

8. Any material in the JMF

For OGFC, submit in writing a complete JMF submittal except asphalt binder content. The Engineer determines the asphalt binder content under California Test 368 within 20 days of your complete JMF submittal and provides you a Form CEM-3513.

### 39-1.03B Hot Mix Asphalt Mix Design

Perform a mix design that produces HMA in compliance with:

#### Hot Mix Asphalt Mix Design Requirements

Quality Characteristic	Test Method	HMA Type		
		A	B	RHMA-G
Air voids content (%)	CT 367 <sup>a</sup>	4.0	4.0	Special Provisions
Voids in mineral aggregate (% min.)	LP-2			
4.75-mm grading		17.0	17.0	--
9.5-mm grading		15.0	15.0	--
12.5-mm grading		14.0	14.0	18.0 – 23.0 <sup>b</sup>
19-mm grading		13.0	13.0	18.0 – 23.0 <sup>b</sup>
Voids filled with asphalt (%)	LP-3			
4.75-mm grading		76.0 – 80.0	76.0 – 80.0	Note d
9.5-mm grading		73.0 – 76.0	73.0 – 76.0	
12.5-mm grading		65.0 – 75.0	65.0 – 75.0	
19-mm grading		65.0 – 75.0	65.0 – 75.0	
Dust proportion	LP-4			
4.75-mm and 9.5-mm gradings		0.9 – 2.0	0.9 – 2.0	Note d
12.5-mm and 19-mm gradings		0.6 – 1.3	0.6 – 1.3	
Stabilometer value (min.) <sup>c</sup>	CT 366			
4.75-mm and 9.5-mm gradings		30	30	--
12.5-mm and 19-mm gradings		37	35	23

Notes:

<sup>a</sup> Calculate the air voids content of each specimen using California Test 309 and Lab Procedure LP-1. Modify California Test 367, Paragraph C5, to use the exact air voids content specified in the selection of OBC.

<sup>b</sup> Voids in mineral aggregate for RHMA-G must be within this range.

<sup>c</sup> Modify California Test 304, Part 2.B.2.c: "After compaction in the compactor, cool to 60 ± 3 °C by allowing the briquettes to cool at room temperature for 0.5-hour, then place the briquettes in the oven at 60 °C for a minimum of 2 hours and not more than 3 hours."

<sup>d</sup> Report this value in the JMF submittal.

For stability and air voids, prepare 3 briquettes at the OBC and test for compliance. Report the average of 3 tests. Prepare new briquettes and test if the range of stability for the 3 briquettes is more than 8 points. The average air void content may vary from the specified air void content by ±0.5 percent.

You may use the briquettes used for stability testing to determine bulk specific gravity under CT 308. If you use the same briquettes and tests using bulk specific gravity fail, you may prepare 3 new briquettes and determine a new bulk specific gravity.

### 39-1.03C Job Mix Formula Submittal

Each JMF submittal must consist of:

- Proposed JMF on Form CEM-3511
- Mix design documentation on Form CEM-3512 dated within 12 months of submittal
- JMF verification on Form CEM-3513, if applicable
- JMF renewal on Form CEM-3514, if applicable
- Materials Safety Data Sheets (MSDS) for:
  - Asphalt binder
  - Base asphalt binder used in asphalt rubber binder
  - CRM and asphalt modifier used in asphalt rubber binder

- 5.4. Blended asphalt rubber binder mixture
- 5.5. Supplemental fine aggregate except fines from dust collectors
- 5.6. Antistrip additives

If the Engineer requests in writing, sample the following materials in the presence of the Engineer and place in labeled containers weighing no more than 22.5 kg each:

1. Coarse, fine, and supplemental fine aggregate from stockpiles, cold feed belts, or hot bins. Samples must include at least 55 kg for each coarse aggregate, 35 kg for each fine aggregate, and 4.5 kg for each type of supplemental fines. The Department combines these aggregate samples to comply with the JMF target values submitted on Form CEM-3511.
2. RAP from stockpiles or RAP system. Samples must be at least 30 kg.
3. Asphalt binder from the binder supplier. Samples must be in two 1-liter cylindrical shaped cans with open top and friction lids.
4. Asphalt rubber binder with the components blended in the proportions to be used. Samples must be in four 1-liter cylindrical shaped cans with open top and friction lids.

Notify the Engineer in writing at least 2 business days before sampling materials. For aggregate and RAP, split the samples into at least 4 parts. Submit 3 parts to the Engineer and use 1 part for your testing.

#### **39-1.03D Job Mix Formula Review**

The Engineer reviews each mix design and proposed JMF within 5 business days from the complete JMF submittal. The review consists of reviewing the mix design procedures and comparing the proposed JMF with the specifications.

The Engineer may verify aggregate qualities during this review period.

#### **39-1.03E Job Mix Formula Verification**

If you cannot submit a Department-verified JMF on Form CEM-3513 dated within 12 months before HMA production, the Engineer verifies the JMF.

Based on your testing and production experience, you may submit on Form CEM-3511 an adjusted JMF before the Engineer's verification testing. JMF adjustments may include a change in the:

1. Asphalt binder content target value up to  $\pm 0.6$  percent from the optimum binder content value submitted on Form CEM-3512 except do not adjust the target value for asphalt rubber binder for RHMA-G below 7.0 percent
2. Aggregate gradation target values within the target value limits specified in the aggregate gradation tables

For HMA Type A, Type B, and RHMA-G, the Engineer verifies the JMF from samples taken from HMA produced by the plant to be used. Notify the Engineer in writing at least 2 business days before sampling materials.

In the Engineer's presence and from the same production run, take samples of:

1. Aggregate
2. Asphalt binder
3. RAP
4. HMA

Sample aggregate from cold feed belts or hot bins. Sample RAP from the RAP system. Sample HMA under California Test 125 except if you request in writing and the Engineer approves, you may sample from any of the following locations:

1. The plant
2. A truck
3. A windrow
4. The paver hopper
5. The mat behind the paver

You may sample from a different project including a non-Department project if you make arrangements for the Engineer to be present during sampling.

For aggregate, RAP, and HMA, split the samples into at least 4 parts and label their containers. Submit 3 split parts to the Engineer and use 1 part for your testing.

The Engineer verifies each proposed JMF within 20 days of receiving verification samples. If you request in writing, the Engineer verifies RHMA-G quality requirements within 3 business days of sampling. Verification is testing for compliance with the specifications for:

1. Aggregate quality
2. Aggregate gradation (JMF TV  $\pm$  tolerance)
3. Asphalt binder content (JMF TV  $\pm$  tolerance)
4. HMA quality specified in the table Hot Mix Asphalt Mix Design Requirements except:
  - 4.1. Air voids content (design value  $\pm$  2.0 percent)
  - 4.2. Voids filled with asphalt (report only if an adjustment for asphalt binder content target value is less than or equal to  $\pm$  0.3 percent from OBC)
  - 4.3. Dust proportion (report only if an adjustment for asphalt binder content target value is less than or equal to  $\pm$  0.3 percent from OBC)

The Engineer prepares 3 briquettes from a single split sample. To verify the JMF for stability and air voids content, the Engineer tests the 3 briquettes and reports the average of 3 tests. The Engineer prepares new briquettes if the range of stability for the 3 briquettes is more than 8 points.

The Engineer may use the briquettes used for stability testing to determine bulk specific gravity under CT 308. If the Engineer uses the same briquettes and the tests using bulk specific gravity fail, the Engineer prepares 3 new briquettes and determines a new bulk specific gravity.

If the Engineer verifies the JMF, the Engineer provides you a Form CEM-3513.

If the Engineer's tests on plant-produced samples do not verify the JMF, the Engineer notifies you in writing and you must submit a new JMF submittal or submit an adjusted JMF based on your testing. JMF adjustments may include a change in the:

1. Asphalt binder content target value up to  $\pm$ 0.6 percent from the optimum binder content value submitted on Form CEM-3512 except do not adjust the target value for asphalt rubber binder for RHMA-G below 7.0 percent
2. Aggregate gradation target values within the target value limits specified in the aggregate gradation tables

You may adjust the JMF only once due to a failed verification test. An adjusted JMF requires a new Form CEM-3511 and verification of a plant-produced sample.

The Engineer reverifies the JMF if HMA production has stopped for longer than 30 days and the verified JMF is older than 12 months.

For each HMA type and aggregate size specified, the Engineer verifies at the State's expense up to 2 proposed JMF including a JMF adjusted after verification failure. The Engineer deducts \$3,000 from payments for each verification exceeding this limit. This deduction does not apply to verifications initiated by the Engineer or if a JMF expires while HMA production is stopped longer than 30 days.

### **39-1.03F Job Mix Formula Renewal**

You may request a JMF renewal by submitting the following:

1. Proposed JMF on Form CEM-3511
2. A previously verified JMF documented on Form CEM-3513 dated within 12 months
3. Mix design documentation on Form CEM-3512 used for the previously verified JMF

If the Engineer request in writing, sample the following materials obtained in the presence of the Engineer and place in labeled containers weighing no more than 22.5 kg each:

1. Coarse, fine, and supplemental fine aggregate from stockpiles, cold feed belts, or hot bins. Samples must include at least 55 kg for each coarse aggregate, 35 kg for each fine aggregate, and 4.5 kg for each type of supplemental fines. The Department combines these aggregate samples to comply with the JMF target values submitted on Form CEM-3511.
2. RAP from stockpiles or RAP system. Samples must be at least 30 kg.
3. Asphalt binder from the binder supplier. Samples must be in two 1-liter cylindrical shaped cans with open top and friction lids.

4. Asphalt rubber binder with the components blended in the proportions to be used. Samples must be in four 1-liter cylindrical shaped cans with open top and friction lids.

Notify the Engineer in writing at least 2 business days before sampling materials. For aggregate and RAP, split samples into at least 4 parts. Submit 3 parts to the Engineer and use 1 part for your testing.

The Engineer reviews each complete JMF renewal submittal within 5 business days.

The Engineer may verify aggregate qualities during this review period.

Notify the Engineer in writing at least 2 business days before sampling materials. For aggregate, RAP, and HMA, split the samples into at least 4 parts. Submit 3 parts to the Engineer and use 1 part for your testing.

The Engineer verifies the JMF renewal submittal under Section 39-1.03E, "Job Mix Formula Verification," except:

1. The Engineer retains samples until you provide test results for your part on Form CEM-3514.
2. The Engineer tests samples of materials obtained from the HMA production unit after you submit test results that comply with the specifications for the quality characteristics under Section 39-1.03E, "Job Mix Formula Verification."
3. The Engineer verifies each proposed JMF within 30 days of receiving verification samples.
4. You may not adjust the JMF due to a failed verification.
5. For each HMA type and aggregate gradation specified, the Engineer verifies at the State's expense 1 proposed JMF.

If the Engineer verifies the JMF renewal, the Engineer provides you a Form CEM-3513.

### **39-1.03G Job Mix Formula Acceptance**

You may start HMA production if:

1. The Engineer's review of the JMF shows compliance with the specifications.
2. The Department has verified the JMF within 12 months before HMA production.
3. The Engineer accepts the verified JMF.

## **39-1.04 CONTRACTOR QUALITY CONTROL**

### **39-1.04A General**

Establish, maintain, and change a quality control system to ensure materials and work comply with the specifications. Submit quality control test results to the Engineer within 3 days of a request except when QC / QA is specified.

You must identify the HMA sampling location in your Quality Control Plan. During production, take samples under California Test 125 except if you request in writing and the Engineer approves, you may sample HMA from:

1. The plant
2. The truck
3. A windrow
4. The paver hopper
5. The mat behind the paver

### **39-1.04B Prepaving Conference**

Meet with the Engineer at a prepaving conference at a mutually agreed time and place. Discuss methods of performing the production and paving work.

### **39-1.04C Asphalt Rubber Binder**

Take asphalt rubber binder samples from the feed line connecting the asphalt rubber binder tank to the HMA plant. Sample and test asphalt rubber binder under Laboratory Procedure LP-11.

Test asphalt rubber binder for compliance with the viscosity specifications in Section 39-1.02, "Materials." During asphalt rubber binder production and HMA production using asphalt rubber binder, measure viscosity every hour with not less than 1 reading for each asphalt rubber binder batch. Log measurements with corresponding time and asphalt rubber binder temperature. Submit the log daily in writing.

Submit a Certificate of Compliance under Section 6-1.07, "Certificates of Compliance." With the Certificate of Compliance, submit test results in writing for CRM and asphalt modifier with each truckload delivered to the HMA

plant. A Certificate of Compliance for asphalt modifier must not represent more than 2250 kg. Use an AASHTO-certified laboratory for testing.

Sample and test gradation and wire and fabric content of CRM once per 4500 kg of scrap tire CRM and once per 1500 kg of high natural CRM. Sample and test scrap tire CRM and high natural CRM separately.

Submit certified weight slips in writing for the CRM and asphalt modifier furnished.

#### **39-1.04D Aggregate**

Determine the aggregate moisture content and RAP moisture content in continuous mixing plants at least twice a day during production and adjust the plant controller. Determine the RAP moisture content in batch mixing plants at least twice a day during production and adjust the plant controller.

#### **39-1.04E Reclaimed Asphalt Pavement**

Perform RAP quality control testing each day.

Sample RAP once daily and determine the RAP aggregate gradation under Laboratory Procedure LP-9 and submit the results to the Engineer in writing with the combined aggregate gradation.

#### **39-1.04F Density Cores**

For Standard and QC / QA projects, take 100-millimeter or 150-millimeter diameter cores at least once every 5 business days. Take 1 core for every 250 tonnes of HMA from random locations the Engineer designates. Take cores in the Engineer's presence and backfill and compact holes with material authorized by the Engineer. Before submitting a core to the Engineer, mark it with the core's location and place it in a protective container.

If a core is damaged, replace it with a core taken within 0.3 m longitudinally from the original core. Relocate any core located within 0.3 m of a rumble strip to 0.3 m transversely away from the rumble strip.

#### **39-1.04G Briquettes**

Prepare 3 briquettes for each stability and air voids determination. Report the average of 3 tests. Prepare new briquettes and test if the range of stability for the 3 briquettes is more than 12 points.

You may use the briquettes used for stability testing to determine bulk specific gravity under CT 308. If you use these briquettes and tests using bulk specific gravity fail, you may prepare 3 new briquettes and determine a new bulk specific gravity.

### **39-1.05 ENGINEER'S ACCEPTANCE**

The Engineer's acceptance of HMA is specified in the sections for each HMA construction process.

The Engineer samples materials for testing under California Test 125 and the applicable test method except samples may be taken from:

1. The plant from:
  - 1.1. A truck
  - 1.2. An automatic sampling device
2. The mat behind the paver

Sampling must be independent of Contractor quality control, statistically-based, and random.

If you request, the Engineer splits samples and provides you with a part.

The Engineer accepts HMA based on:

1. Accepted JMF
2. Accepted QCP for Standard and QC / QA
3. Compliance with the HMA Acceptance tables
4. Acceptance of a lot for QC / QA
5. Visual inspection

The Engineer prepares 3 briquettes for each stability and air voids determination. The Engineer reports the average of 3 tests. The Engineer prepares new briquettes and test if the range of stability for the 3 briquettes is more than 8 points.

The Engineer may use the briquettes used for stability testing to determine bulk specific gravity under CT 308. If the Engineer uses the same briquettes and the tests using bulk specific gravity fail, the Engineer prepares 3 new briquettes and determines a new bulk specific gravity.

#### **39-1.06 DISPUTE RESOLUTION**

You and the Engineer must work together to avoid potential conflicts and to resolve disputes regarding test result discrepancies. Notify the Engineer in writing within 5 days of receiving a test result if you dispute the test result.

If you or the Engineer dispute each other's test results, submit written quality control test results and copies of paperwork including worksheets used to determine the disputed test results to the Engineer. An Independent Third Party (ITP) performs referee testing. Before the ITP participates in a dispute resolution, the ITP must be accredited under the Department's Independent Assurance Program. The ITP must be independent of the project. By mutual agreement, the ITP is chosen from:

1. A Department laboratory
2. A Department laboratory in a district or region not in the district or region the project is located
3. The Transportation Laboratory
4. A laboratory not currently employed by you or your HMA producer

If split quality control or acceptance samples are not available, the ITP uses any available material representing the disputed HMA for evaluation.

#### **39-1.07 PRODUCTION START-UP EVALUATION**

The Engineer evaluates HMA production and placement at production start-up.

Within the first 750 tonnes produced on the first day of HMA production, in the Engineer's presence and from the same production run, take samples of:

1. Aggregate
2. Asphalt binder
3. RAP
4. HMA

Sample aggregate from cold feed belts or hot bins. Take RAP samples from the RAP system. Sample HMA under California Test 125 except if you request in writing and the Engineer approves, you may sample HMA from:

1. The plant
2. The truck
3. A windrow
4. The paver hopper
5. The mat behind the paver

For aggregate, RAP, and HMA, split the samples into at least 4 parts and label their containers. Submit 3 split parts to the Engineer and keep 1 part.

For Standard and QC / QA projects, you and the Engineer must test the split samples and report test results in writing within 3 business days of sampling. If you proceed before receipt of the test results, the Engineer may consider the HMA placed to be represented by these test results.

For Standard and QC / QA projects, take 100-millimeter or 150-millimeter diameter first 750 tonnes on the first day of HMA production. For each density core, the Engineer reports the bulk specific gravity determined under California Test 308, Method A in addition to the percent of maximum theoretical density. You may test for in-place density at the density core locations and include them in your production tests for percent of maximum theoretical density.

#### **39-1.08 PRODUCTION**

##### **39-1.08A General**

Produce HMA in a batch mixing plant or a continuous mixing plant. Proportion aggregate by hot or cold feed control.

HMA plants must be Department-qualified. Before production, the HMA plant must have a current qualification under the Department's Materials Plant Quality Program.



During production, you may adjust:

1. Hot or cold feed proportion controls for virgin aggregate and RAP
2. The set point for asphalt binder content

#### **39-1.08B Mixing**

Mix HMA ingredients into a homogeneous mixture of coated aggregates.

Asphalt binder must be between 135 °C and 190 °C when mixed with aggregate.

Asphalt rubber binder must be between 177 °C and 218 °C when mixed with aggregate.

When mixed with asphalt binder, aggregate must not be more than 163 °C except aggregate for OGFC with unmodified asphalt binder must be not more than 135 °C. Aggregate temperature specifications do not apply when you use RAP.

HMA with or without RAP must not be more than 163 °C.

#### **39-1.08C Asphalt Rubber Binder**

Deliver scrap tire CRM and high natural CRM in separate bags.

Either proportion and mix asphalt binder, asphalt modifier, and CRM simultaneously or premix the asphalt binder and asphalt modifier before adding CRM. If you premix asphalt binder and asphalt modifier, mix them for at least 20 minutes. When you add CRM, the asphalt binder and asphalt modifier must be between 177 °C and 218 °C.

Do not use asphalt rubber binder during the first 45 minutes of the reaction period. During this period, the asphalt rubber binder mixture must be between 177 °C and the lower of 218 °C or 6 °C below the asphalt binder's flash point indicated in the MSDS.

If any asphalt rubber binder is not used within 4 hours after the reaction period, discontinue heating. If the asphalt rubber binder drops below 177 °C, reheat before use. If you add more scrap tire CRM to the reheated asphalt rubber binder, the binder must undergo a 45-minute reaction period. The added scrap tire CRM must not exceed 10 percent of the total asphalt rubber binder mass. Reheated and reacted asphalt rubber binder must comply with the viscosity specifications for asphalt rubber binder in Section 39-1.02, "Materials." Do not reheat asphalt rubber binder more than twice.

### **39-1.09 SUBGRADE, TACK COAT, AND GEOSYNTHETIC PAVEMENT INTERLAYER**

#### **39-1.09A General**

Prepare subgrade or apply tack coat to surfaces receiving HMA. If specified, place geosynthetic pavement interlayer over a coat of asphalt binder.

#### **39-1.09B Subgrade**

Subgrade to receive HMA must comply with the compaction and elevation tolerance specifications in the sections for the material involved. Subgrade must be free of loose and extraneous material. If HMA is paved on existing base or pavement, remove loose paving particles, dirt, and other extraneous material by any means including flushing and sweeping.

#### **39-1.09C Tack Coat**

Apply tack coat:

1. To existing pavement including planed surfaces
2. Between HMA layers
3. To vertical surfaces of:
  - 3.1. Curbs
  - 3.2. Gutters
  - 3.3. Construction joints

Before placing HMA, apply tack coat in 1 application at the minimum residual rate specified for the condition of the underlying surface:

### Tack Coat Application Rates for HMA Type A, Type B, and RHMA-G

HMA over:	Minimum Residual Rates (liters per square meter)		
	CSS1/CSS1h, SS1/SS1h and QS1h/CQS1h Asphaltic Emulsion	CRS1/CRS2, RS1/RS2 and QS1/CQS1 Asphaltic Emulsion	Asphalt Binder and PMRS2/PMCRS2 and PMRS2h/PMCRS2h Asphaltic Emulsion
New HMA (between layers)	0.09	0.14	0.09
Existing AC and PCC pavement	0.14	0.18	0.14
Planned pavement	0.23	0.27	0.18

### Tack Coat Application Rates for OGFC

OGFC over:	Minimum Residual Rates (liters per square meter)		
	CSS1/CSS1h, SS1/SS1h and QS1h/CQS1h Asphaltic Emulsion	CRS1/CRS2, RS1/RS2 and QS1/CQS1 Asphaltic Emulsion	Asphalt Binder and PMRS2/PMCRS2 and PMRS2h/PMCRS2h Asphaltic Emulsion
New HMA	0.14	0.18	0.14
Existing AC and PCC pavement	0.23	0.27	0.18
Planned pavement	0.27	0.32	0.23

If you dilute asphaltic emulsion, mix until homogeneous before application.

Apply to vertical surfaces with a residual tack coat rate that will thoroughly coat the vertical face without running off.

If you request in writing and the Engineer authorizes, you may:

1. Change tack coat rates
2. Omit tack coat between layers of new HMA during the same work shift if:
  - 2.1. No dust, dirt, or extraneous material is present
  - 2.2. The surface is at least 60 °C

Immediately in advance of placing HMA, apply additional tack coat to damaged areas or where loose or extraneous material is removed.

Close areas receiving tack coat to traffic. Do not track tack coat onto pavement surfaces beyond the job site.

Asphalt binder tack coat must be between 140 °C and 175 °C when applied.

### 39-1.09D Geosynthetic Pavement Interlayer

Place geosynthetic pavement interlayer in compliance with the manufacturer's recommendations.

Before placing the geosynthetic pavement interlayer and asphalt binder:

1. Repair cracks 6.5 mm and wider, spalls, and holes in the pavement. The State pays for this repair work under Section 4-1.03D, "Extra Work."
2. Clean the pavement of loose and extraneous material.

Immediately before placing the interlayer, apply 1.13 L  $\pm$  0.14 L of asphalt binder per square meter of interlayer or until the fabric is saturated. Apply asphalt binder the width of the geosynthetic pavement interlayer plus 75 mm on each side. At interlayer overlaps, apply asphalt binder on the lower interlayer the same overlap distance as the upper interlayer.

Align and place the interlayer with no overlapping wrinkles, except a wrinkle that overlaps may remain if it is less than 12.5 mm thick. If the overlapping wrinkle is more than 12.5 mm thick, cut the wrinkle out and overlap the interlayer no more than 50 mm.

The minimum HMA thickness over the interlayer must be 35 mm thick including conform tapers. Do not place the interlayer on a wet or frozen surface.

Overlap the interlayer borders between 50 mm and 100 mm. In the direction of paving, overlap the following roll with the preceding roll at any break.

You may use rolling equipment to correct distortions or wrinkles in the interlayer.

If asphalt binder tracked onto the interlayer or brought to the surface by construction equipment causes interlayer displacement, cover it with a small quantity of HMA.

Before placing HMA on the interlayer, do not expose the interlayer to:

1. Traffic except for crossings under traffic control and only after you place a small HMA quantity
2. Sharp turns from construction equipment
3. Damaging elements

Pave HMA on the interlayer during the same work shift.

### **39-1.10 SPREADING AND COMPACTING EQUIPMENT**

Paving equipment for spreading must be:

1. Self-propelled
2. Mechanical
3. Equipped with a screed or strike-off assembly that can distribute HMA the full width of a traffic lane
4. Equipped with a full-width compacting device
5. Equipped with automatic screed controls and sensing devices that control the thickness, longitudinal grade, and transverse screed slope

Install and maintain grade and slope references.

The screed must produce a uniform HMA surface texture without tearing, shoving, or gouging.

The paver must not leave marks such as ridges and indentations unless you can eliminate them by rolling.

Rollers must be equipped with a system that prevents HMA from sticking to the wheels. You may use a parting agent that does not damage the HMA or impede the bonding of layers.

In areas inaccessible to spreading and compacting equipment:

1. Spread the HMA by any means to obtain the specified lines, grades and cross sections.
2. Use a pneumatic tamper, plate compactor, or equivalent to achieve thorough compaction.

### **39-1.11 TRANSPORTING, SPREADING, AND COMPACTING**

Do not pave HMA on a wet pavement or frozen surface.

You may deposit HMA in a windrow and load it in the paver if:

1. Paver is equipped with a hopper that automatically feeds the screed
2. Loading equipment can pick up the windrowed material and deposit it in the paver hopper without damaging base material
3. Activities for deposit, pick-up, loading, and paving are continuous
4. HMA temperature in the windrow does not fall below 127 °C

You may pave HMA in 1 or more layers on areas less than 1.5 m wide and outside the traveled way including shoulders. You may use mechanical equipment other than a paver for these areas. The equipment must produce a uniform smoothness and texture.

HMA handled, spread, or windrowed must not stain the finished surface of any improvement including pavement.

Do not use petroleum products such as kerosene or diesel fuel to release HMA from trucks, spreaders, or compactors.

HMA must be free of:

1. Segregation
2. Coarse or fine aggregate pockets
3. Hardened lumps

Longitudinal joints in the top layer must match specified lane edges. Alternate longitudinal joint offsets in lower layers at least 0.15 m from each side of the specified lane edges. You may request in writing other longitudinal joint placement patterns.

Until the adjoining through lane's top layer has been paved, do not pave the top layer of:

1. Shoulders
2. Tapers
3. Transitions
4. Road connections
5. Driveways
6. Curve widenings
7. Chain control lanes
8. Turnouts
9. Turn pockets

If the number of lanes change, pave each through lane's top layer before paving a tapering lane's top layer. Simultaneous to paving a through lane's top layer, you may pave an adjoining area's top layer including shoulders. Do not operate spreading equipment on any area's top layer until completing final compaction.

If HMA (leveling) is specified, fill and level irregularities and ruts with HMA before spreading HMA over base, existing surfaces, or bridge decks. You may use mechanical equipment other than a paver for these areas. The equipment must produce a uniform smoothness and texture. HMA used to change an existing surface's cross slope or profile is not HMA (leveling).

If placing HMA against the edge of existing pavement, sawcut or grind the pavement straight and vertical along the joint and remove extraneous material without damaging the surface remaining in place. If placing HMA against the edge of a longitudinal or transverse construction joint and the joint is damaged or not placed to a neat line, sawcut or grind the pavement straight and vertical along the joint and remove extraneous material without damaging the surface remaining in place. Repair or remove and replace damaged pavement at your expense.

Rolling must leave the completed surface compacted and smooth without tearing, cracking, or shoving. Complete finish rolling activities before the pavement surface temperature is:

1. Below 65 °C for HMA with unmodified binder
2. Below 60 °C for HMA with modified binder
3. Below 93 °C for RHMA-G

If a vibratory roller is used as a finish roller, turn the vibrator off.

Do not use a pneumatic tired roller to compact RHMA-G.

For Standard and QC/QA, if a 19-millimeter aggregate grading is specified, you may use a 12.5-millimeter aggregate grading if the specified paved thickness is from between 38 mm and 60 mm thick.

Spread and compact HMA under Section 39-3.03, "Spreading and Compacting Equipment," and Section 39-3.04, "Transporting, Spreading, and Compacting," for any of the following:

1. Specified paved thickness is less than 45 mm.
2. Specified paved thickness is less than 60 mm and a 19-millimeter aggregate grading is specified and used.
3. You spread and compact at:
  - 3.1. Asphalt concrete surfacing replacement areas
  - 3.2. Leveling courses
  - 3.3. Areas the Engineer determines conventional compaction and compaction measurement methods are impeded

Do not allow traffic on new HMA pavement until its mid-depth temperature is below 71 °C.

If you request in writing and the Engineer authorizes, you may cool HMA Type A and Type B with water when rolling activities are complete. Apply water under Section 17, "Watering."

Spread sand at a rate between 0.5 kg and 1 kg per square meter on new RHMA-G, RHMA-O, and RHMA-O-HB pavement when finish rolling is complete. Sand must be free of clay or organic matter. Sand must comply with Section 90-3.03, "Fine Aggregate Grading." Keep traffic off the pavement until spreading sand is complete.

### **39-1.12 SMOOTHNESS**

#### **39-1.12A General**

Determine HMA smoothness with a profilograph and a straightedge.

Smoothness specifications do not apply to OGFC placed on existing pavement not constructed under the same project.

If portland cement concrete is placed on HMA:

1. Cold plane the HMA finished surface to within specified tolerances if it is higher than the grade specified by the Engineer.
2. Remove and replace HMA if the finished surface is lower than 15 mm below the grade specified by the Engineer.

### **39-1.12B Straightedge**

The HMA pavement top layer must not vary from the lower edge of a 3.66-meter long straightedge:

1. More than 3 mm when the straight edge is laid parallel with the centerline
2. More than 6 mm when the straightedge is laid perpendicular to the centerline and extends from edge to edge of a traffic lane
3. More than 6 mm when the straightedge is laid within 7.3 m of a pavement conform

### **39-1.12C Profilograph**

Under California Test 526, determine the zero (null) blanking band Profile Index ( $PI_0$ ) and must-grinds on the top layer of HMA Type A, Type B, and RHMA-G pavement. Take 2 profiles within each traffic lane, 1 m from and parallel with the edge of each lane.

A must-grind is a deviation of 7.5 mm or more in a length of 7.5 m. You must correct must-grinds.

For OGFC, only determine must-grinds when placed over HMA constructed under the same project. The top layer of the underlying HMA must comply with the smoothness specifications before placing OGFC.

Profile pavement in the Engineer's presence. Choose the time of profiling.

On tangents and horizontal curves with a centerline radius of curvature 600 m or more, the  $PI_0$  must be at most 75 mm per 160-meter section.

On horizontal curves with a centerline radius of curvature between 300 m and 600 m including pavement within the superelevation transitions, the  $PI_0$  must be at most 150 mm per 160-meter section.

Before the Engineer accepts HMA pavement for smoothness, submit written final profilograms.

Submit 1 electronic copy of profile information in Microsoft Excel and 1 electronic copy of longitudinal pavement profiles in ".erd" format or other ProVAL compatible format to the Engineer and to:

Smoothness@dot.ca.gov

The following HMA pavement areas do not require a  $PI_0$ . You must measure these areas with a 3.6-meter straightedge and determine must-grinds with a profilograph:

1. New HMA with a total thickness less than or equal to 75 mm
2. HMA sections of city or county streets and roads, turn lanes and collector lanes that are less than 460 m in length

The following HMA pavement areas do not require a  $PI_0$ . You must measure these areas with a 3.6-meter straightedge:

1. Horizontal curves with a centerline radius of curvature less than 300 m including pavement within the superelevation transitions of those curves
2. Within 3.66 m of a transverse joint separating the pavement from:
  - 2.1. Existing pavement not constructed under the same project
  - 2.2. A bridge deck or approach slab
3. Exit ramp termini, truck weigh stations, and weigh-in-motion areas
4. If steep grades and superelevation rates greater than 6 percent are present on:
  - 4.1. Ramps
  - 4.2. Connectors
5. Turn lanes
6. Areas within 5 m of manholes or drainage transitions
7. Acceleration and deceleration lanes for at-grade intersections

8. Shoulders and miscellaneous areas
9. HMA pavement within 1 m from and parallel to the construction joints formed between curbs, gutters, or existing pavement

#### **39-1.12D Smoothness Correction**

If the top layer of HMA Type A, Type B, or RHMA-G pavement does not comply with the smoothness specifications, grind the pavement to within tolerances, remove and replace it, or place a layer of HMA. The Engineer must authorize your choice of correction before the work begins.

Remove and replace the areas of OGFC not in compliance with the must-grind and straightedge specifications, except you may grind OGFC for correcting smoothness:

1. At a transverse joint separating the pavement from pavement not constructed under the same project
2. Within 3.66 m of a transverse joint separating the pavement from a bridge deck or approach slab

Corrected HMA pavement areas must be uniform rectangles with edges:

1. Parallel to the nearest HMA pavement edge or lane line
2. Perpendicular to the pavement centerline

Measure the corrected HMA pavement surface with a profilograph and a 3.66-meter straightedge and correct the pavement to within specified tolerances. If a must-grind area or straightedged pavement cannot be corrected to within specified tolerances, remove and replace the pavement.

On ground areas not overlaid with OGFC, apply fog seal coat under Section 37-1, "Seal Coats."

#### **39-1.13 MISCELLANEOUS AREAS AND DIKES**

Miscellaneous areas are outside the traveled way and include:

1. Median areas not including inside shoulders
2. Island areas
3. Sidewalks
4. Gutters
5. Gutter flares
6. Ditches
7. Overside drains
8. Aprons at the ends of drainage structures

Spread miscellaneous areas in 1 layer and compact to the specified lines and grades.

For miscellaneous areas and dikes:

1. Do not submit a JMF.
2. Choose the 9.5-millimeter or 12.5-millimeter HMA Type A and Type B aggregate gradations.
3. Minimum asphalt binder content must be 6.8 percent for 9.5-millimeter aggregate and 6.0 percent for 12.5-millimeter aggregate. If you request in writing and the Engineer authorizes, you may reduce the minimum asphalt binder content.
4. Choose asphalt binder Grade PG 70-10 or the same grade specified for HMA.

### **39-2 STANDARD**

#### **39-2.01 DESCRIPTION**

If HMA is specified as Standard, construct it under Section 39-1, "General," this Section 39-2, "Standard," and Section 39-5, "Measurement and Payment."

#### **39-2.02 CONTRACTOR QUALITY CONTROL**

##### **39-2.02A Quality Control Plan**

Establish, implement, and maintain a Quality Control Plan (QCP) for HMA. The QCP must describe the organization and procedures you will use to:

1. Control the quality characteristics

2. Determine when corrective actions are needed (action limits)
3. Implement corrective actions

When you submit the proposed JMF, submit the written QCP. You and the Engineer must discuss the QCP during the prepaving conference.

The QCP must address the elements affecting HMA quality including:

1. Aggregate
2. Asphalt binder
3. Additives
4. Production
5. Paving

The Engineer reviews each QCP within 5 business days from the submittal. Hold HMA production until the Engineer accepts the QCP in writing. The Engineer's QCP acceptance does not mean your compliance with the QCP will result in acceptable HMA. Section 39-1.05, "Engineer's Acceptance," specifies HMA acceptance.

#### **39-2.02B Quality Control Testing**

Perform sampling and testing at the specified frequency for the following quality characteristics:

**Minimum Quality Control – Standard**

Quality Characteristic	Test Method	Minimum Sampling and Testing Frequency	HMA Type			
			A	B	RHMA-G	OGFC
Aggregate gradation <sup>a</sup>	CT 202	1 per 750 tonnes and any remaining part	JMF ± Tolerance <sup>b</sup>	JMF ± Tolerance <sup>b</sup>	JMF ± Tolerance <sup>b</sup>	JMF ± Tolerance <sup>b</sup>
Sand equivalent (min.) <sup>c</sup>	CT 217		47	42	47	--
Asphalt binder content (%)	CT 379 or 382		JMF ± 0.45	JMF ± 0.45	JMF ± 0.50	JMF ± 0.50
HMA moisture content (% max.)	CT 226 or CT 370	1 per 2500 tonnes but not less than 1 per paving day	1.0	1.0	1.0	1.0
Percent of maximum theoretical density (%) <sup>d, e</sup>	Quality control plan	2 per business day (min.)	91 - 97	91 - 97	91 - 97	--
Stabilometer value (min.) <sup>c, f</sup> 4.75-mm and 9.5-mm gradings 12.5-mm and 19-mm gradings	CT 366	One per 4000 tonnes or 2 per 5 business days, whichever is more	30	30	--	--
			37	35	23	--
Air voids content (%) <sup>c, g</sup>	CT 367		4 ± 2	4 ± 2	Specification ± 2	--
Aggregate moisture content at continuous mixing plants and RAP moisture content at continuous mixing plants and batch mixing plants <sup>h</sup>	CT 226 or CT 370	2 per day during production	--	--	--	--
Percent of crushed particles coarse aggregate (% min.) One fractured face Two fractured faces Fine aggregate (% min) (Passing 4.75-mm sieve and retained on 2.36-mm sieve.) One fractured face	CT 205	As necessary and designated in the QCP. At least once per project	90	25	--	90
			75	--	90	75
			70	20	70	90
Los Angeles Rattler (% max.) Loss at 100 rev. Loss at 500 rev.	CT 211		12 45	-- 50	12 40	12 40



Flat and elongated particles (% max. by mass @ 5:1)	ASTM D 4791		Report only	Report only	Report only	Report only
Fine aggregate angularity (% min.)	AASHTO T 304, Method A		45	45	45	--
Voids filled with asphalt (%) <sup>i</sup> 4.75-mm grading 9.5-mm grading 12.5-mm grading 19-mm grading	LP-3		76.0 – 80.0 73.0 – 76.0 65.0 – 75.0 65.0 – 75.0	76.0 – 80.0 73.0 – 76.0 65.0 – 75.0 65.0 – 75.0	Report only	--
Voids in mineral aggregate (% min.) <sup>i</sup> 4.75-mm grading 9.5-mm grading 12.5-mm grading 19-mm grading	LP-2		17.0 15.0 14.0 13.0	17.0 15.0 14.0 13.0	-- -- 18.0 – 23.0 <sup>j</sup> 18.0 – 23.0 <sup>j</sup>	--
Dust proportion <sup>i</sup> 4.75-mm and 9.5-mm gradings 12.5-mm and 19-mm gradings	LP-4		0.9 – 2.0 0.6 – 1.3	0.9 – 2.0 0.6 – 1.3	Report only	--
Smoothness	Section 39-1.12	--	3.66-m straightedge, must-grind, and PI <sub>0</sub>	3.66-m straightedge, must-grind, and PI <sub>0</sub>	3.66-m straightedge, must-grind, and PI <sub>0</sub>	3.66-m straightedge and must-grind
Asphalt rubber binder viscosity @ 177 °C, centipoises	Section 39-1.02D	Section 39-1.04C	--	--	1500 – 4000	1500 – 4000
Asphalt modifier	Section 39-1.02D	Section 39-1.04C	--	--	Section 39-1.02D	Section 39-1.02D
Crumb rubber modifier	Section 39-1.02D	Section 39-1.04C	--	--	Section 39-1.02D	Section 39-1.02D

Notes:

<sup>a</sup> Determine combined aggregate gradation containing RAP under Laboratory Procedure LP-9.

<sup>b</sup> The tolerances must comply with the allowable tolerances in Section 39-1.02E, "Aggregate."

<sup>c</sup> Report the average of 3 tests from a single split sample.

<sup>d</sup> Required for HMA Type A, Type B, and RHMA-G if the specified paved thickness is at least 45 mm.

<sup>e</sup> Determine maximum theoretical density (California Test 309) at the frequency specified for Test Maximum Density under California Test 375, Part 5.D.

<sup>f</sup> Modify California Test 304, Part 2.B.2.c: "After compaction in the mechanical compactor, cool to 60 °C ± 3 °C by allowing the briquettes to cool at room temperature for 0.5 hour, then place the briquettes in the oven at 69 °C for a minimum of 2 hours and not more than 3 hours."

<sup>g</sup> Determine the bulk specific gravity of each lab-compacted briquette under California Test 308, Method A, and theoretical maximum specific gravity under California Test 309.

<sup>h</sup> For adjusting the plant controller at the HMA plant.

<sup>i</sup> Report only if the adjustment for asphalt binder content target value is less than or equal to ± 0.3 percent from OBC.

<sup>j</sup> Voids in mineral aggregate for RHMA-G must be within this range.

For any single quality characteristic except smoothness, if 2 consecutive quality control test results do not comply with the action limits or specifications:

1. Stop production.
2. Notify the Engineer in writing.
3. Take corrective action.

4. Demonstrate compliance with the specifications before resuming production and placement on the State highway.

### **39-2.03 ENGINEER'S ACCEPTANCE**

#### **39-2.03A Testing**

The Engineer samples for acceptance testing and tests for:

**HMA Acceptance - Standard**

Quality Characteristic				Test Method	HMA Type						
					A	B	RHMA-G	OGFC			
Aggregate gradation <sup>a</sup>				CT 202	JMF ± Tolerance <sup>c</sup>	JMF ± Tolerance <sup>c</sup>	JMF ± Tolerance <sup>c</sup>	JMF ± Tolerance <sup>c</sup>			
Sieve	19-mm	12.5-mm	9.5-mm								
12.5-mm	X <sup>b</sup>										
9.5-mm		X									
2.36-mm	X	X	X								
0.075-mm	X	X	X								
Sand equivalent (min.) <sup>d</sup>				CT 217	47	42	47	--			
Asphalt binder content (%)				CT 379 or 382	JMF ± 0.45	JMF ± 0.45	JMF ± 0.5	JMF ± 0.50			
HMA moisture content (% max.)				CT 226 or CT 370	1.0	1.0	1.0	1.0			
Percent of maximum theoretical density (%) <sup>e, f</sup>				CT 375	91 – 97	91 – 97	91 – 97	--			
Stabilometer value (min.) <sup>d, g</sup> 4.75-mm and 9.5-mm gradings 12.5-mm and 19-mm gradings				CT 366	30 37	30 35	-- 23	-- --			
Air voids content (%) <sup>d, h</sup>					CT 367	4 ± 2	4 ± 2	Specification ± 2	--		
Percent of crushed particles Coarse aggregate (% min.) One fractured face Two fractured faces Fine aggregate (% min.) (Passing 4.75-mm sieve and retained on 2.36-mm sieve.) One fractured face				CT 205	90 75	25 --	-- 90	90 75			
Percent of crushed particles Coarse aggregate (% min.) One fractured face Two fractured faces					70	20	70	90			
Los Angeles Rattler (% max.) Loss at 100 rev. Loss at 500 rev.					CT 211	12 45	-- 50	12 40	12 40		
Fine aggregate angularity (% min.)				AASHTO T 304, Method A	45	45	45	--			
Flat and elongated particles (% max. by mass @ 5:1)				ASTM D 4791	Report only	Report only	Report only	Report only			
Voids filled with asphalt (%) <sup>i</sup> 4.75-mm grading 9.5-mm grading 12.5-mm grading 19-mm grading				LP-3	76.0 – 80.0 73.0 – 76.0 65.0 – 75.0 65.0 – 75.0	76.0 – 80.0 73.0 – 76.0 65.0 – 75.0 65.0 – 75.0	Report only	--			
Voids in mineral aggregate (% min.) <sup>i</sup> 4.75-mm grading 9.5-mm grading 12.5-mm grading 19-mm grading					17.0 15.0 14.0 13.0	17.0 15.0 14.0 13.0			-- -- 18.0 – 23.0 <sup>j</sup> 18.0 – 23.0 <sup>j</sup>		
Dust proportion <sup>i</sup> 4.75-mm and 9.5-mm gradings					LP-4	0.9 – 2.0			0.9 – 2.0	Report only	--

12.5-mm and 19-mm gradings		0.6 – 1.3	0.6 – 1.3		
Smoothness	Section 39-1.12	3.66-m straightedge, must-grind, and $PI_0$	3.66-m straightedge, must-grind, and $PI_0$	3.66-m straightedge, must-grind, and $PI_0$	3.66-m straightedge and must-grind
Asphalt binder	Various	Section 92	Section 92	Section 92	Section 92
Asphalt rubber binder	Various	--	--	Section 92-1.02(C) and Section 39-1.02D	Section 92-1.02(C) and Section 39-1.02D
Asphalt modifier	Various	--	--	Section 39-1.02D	Section 39-1.02D
Crumb rubber modifier	Various	--	--	Section 39-1.02D	Section 39-1.02D

<sup>a</sup> The Engineer determines combined aggregate gradations containing RAP under Laboratory Procedure LP-9.

<sup>b</sup> "X" denotes the sieves the Engineer considers for the specified aggregate gradation.

<sup>c</sup> The tolerances must comply with the allowable tolerances in Section 39-1.02E, "Aggregate."

<sup>d</sup> The Engineer reports the average of 3 tests from a single split sample.

<sup>e</sup> The Engineer determines percent of maximum theoretical density if the specified paved thickness is at least 45-mm under California Test 375 except the Engineer uses:

1. California Test 308, Method A, to determine in-place density of each density core instead of using the nuclear gauge in Part 4, "Determining In-Place Density By The Nuclear Density Device."
2. California Test 309 to determine maximum theoretical density instead of calculating test maximum density in Part 5, "Determining Test Maximum Density."

<sup>f</sup> The Engineer determines maximum theoretical density (California Test 309) at the frequency specified for Test Maximum Density under California Test 375, Part 5.D.

<sup>g</sup> Modify California Test 304, Part 2.B.2.c: "After compaction in the mechanical compactor, cool to  $60\text{ }^{\circ}\text{C} \pm 3\text{ }^{\circ}\text{C}$  by allowing the briquettes to cool at room temperature for 0.5 hour, then place the briquettes in the oven at  $69\text{ }^{\circ}\text{C}$  for a minimum of 2 hours and not more than 3 hours."

<sup>h</sup> The Engineer determines the bulk specific gravity of each lab-compacted briquette under California Test 308, Method A, and theoretical maximum specific gravity under California Test 309.

<sup>i</sup> Report only if the adjustment for asphalt binder content target value is less than or equal to  $\pm 0.3$  percent from OBC.

<sup>j</sup> Voids in mineral aggregate for RHMA-G must be within this range.

No single test result may represent more than the smaller of 750 tonnes or 1 day's production.

For any single quality characteristic except smoothness, if 2 consecutive acceptance test results do not comply with the specifications:

1. Stop production.
2. Take corrective action.
3. In the Engineer's presence, take samples and split each sample into 4 parts. Test 1 part for compliance with the specifications and submit 3 parts to the Engineer. The Engineer tests 1 part for compliance with the specifications and reserves and stores 2 parts.
4. Demonstrate compliance with the specifications before resuming production and placement on the State highway.

The Engineer tests the density core you take from each 250 tonnes of HMA production. The Engineer determines the percent of maximum theoretical density for each density core by determining the density core's density and dividing by the maximum theoretical density.

If the specified total paved thickness is at least 45 mm and any layer is less than 45 mm, the Engineer determines the percent of maximum theoretical density from density cores taken from the final layer measured the full depth of the total paved HMA thickness.

For percent of maximum theoretical density, the Engineer determines a deduction for each test result outside the specifications in compliance with:

**Reduced Payment Factors for Percent of Maximum Theoretical Density**

HMA Type A and B and RHMA-G Percent of Maximum Theoretical Density	Reduced Payment Factor	HMA Type A and B and RHMA-G Percent of Maximum Theoretical Density	Reduced Payment Factor
91.0	0.0000	97.0	0.0000
90.9	0.0125	97.1	0.0125
90.8	0.0250	97.2	0.0250
90.7	0.0375	97.3	0.0375
90.6	0.0500	97.4	0.0500
90.5	0.0625	97.5	0.0625
90.4	0.0750	97.6	0.0750
90.3	0.0875	97.7	0.0875
90.2	0.1000	97.8	0.1000
90.1	0.1125	97.9	0.1125
90.0	0.1250	98.0	0.1250
89.9	0.1375	98.1	0.1375
89.8	0.1500	98.2	0.1500
89.7	0.1625	98.3	0.1625
89.6	0.1750	98.4	0.1750
89.5	0.1875	98.5	0.1875
89.4	0.2000	98.6	0.2000
89.3	0.2125	98.7	0.2125
89.2	0.2250	98.8	0.2250
89.1	0.2375	98.9	0.2375
89.0	0.2500	99.0	0.2500
< 89.0	Remove and Replace	> 99.0	Remove and Replace

**39-2.04 TRANSPORTING, SPREADING, AND COMPACTING**

Determine the number of rollers needed to obtain the specified density and surface finish.

**39-3 METHOD**

**39-3.01 DESCRIPTION**

If HMA is specified as Method, construct it under Section 39-1, "General," this Section 39-3, "Method," and Section 39-5, "Measurement and Payment."

**39-3.02 ENGINEER'S ACCEPTANCE**

**39-3.02A Testing**

The Engineer samples for acceptance testing and tests for:

**HMA Acceptance - Method**

Quality Characteristic	Test Method	HMA Type			
		A	B	RHMA-G	OGFC
Aggregate gradation <sup>a</sup>	CT 202	JMF ± Tolerance <sup>b</sup>	JMF ± Tolerance <sup>b</sup>	JMF ± Tolerance <sup>b</sup>	JMF ± Tolerance <sup>b</sup>
Sand equivalent (min.) <sup>c</sup>	CT 217	47	42	47	--
Asphalt binder content (%)	CT 379 or 382	JMF ± 0.45	JMF ± 0.45	JMF ± 0.5	JMF ± 0.50
HMA moisture content (% max.)	CT 226 or CT 370	1.0	1.0	1.0	1.0
Stabilometer value (min.) <sup>c, d</sup>	CT 366				
4.75-mm and 9.5-mm gradings		30	30	--	--
12.5-mm and 19-mm gradings		37	35	23	--
Percent of crushed particles	CT 205				
Coarse aggregate (% min.)					
One fractured face		90	25	--	90
Two fractured faces		75	--	90	75
Fine aggregate (% min)					
(Passing 4.75-mm sieve and retained on 2.36-mm sieve.)					
One fractured face		70	20	70	90
Los Angeles Rattler (% max.)	CT 211				
Loss at 100 rev.		12	--	12	12
Loss at 500 rev.		45	50	40	40
Air voids content (%) <sup>c, e</sup>	CT 367	4 ± 2	4 ± 2	Specification ± 2	--
Fine aggregate angularity (% min.)	AASHTO T 304, Method A	45	45	45	--
Flat and elongated particles (% max. by mass @ 5:1)	ASTM D 4791	Report only	Report only	Report only	Report only
Voids filled with asphalt (%) <sup>f</sup>	LP-3			Report only	
4.75-mm grading		76.0 – 80.0	76.0 – 80.0		--
9.5-mm grading		73.0 – 76.0	73.0 – 76.0		
12.5-mm grading		65.0 – 75.0	65.0 – 75.0		
19-mm grading		65.0 – 75.0	65.0 – 75.0		
Voids in mineral aggregate (% min.) <sup>f</sup>	LP-2				
4.75-mm grading		17.0	17.0	--	--
9.5-mm grading		15.0	15.0	--	
12.5-mm grading		14.0	14.0	18.0 – 23.0 <sup>g</sup>	
19-mm grading		13.0	13.0	18.0 – 23.0 <sup>g</sup>	
Dust proportion <sup>f</sup>	LP-4				
4.75-mm and 9.5-mm gradings		0.9 – 2.0	0.9 – 2.0	Report only	--
12.5-mm and 19-mm gradings		0.6 – 1.3	0.6 – 1.3		
Smoothness	Section 39-1.12	3.66-m straightedge and must-grind	3.66-m straightedge and must-grind	3.66-m straightedge and must-grind	3.66-m straightedge and must-grind
Asphalt binder	Various	Section 92	Section 92	Section 92	Section 92

Asphalt rubber binder	Various	--	--	Section 92-1.02(C) and Section 39-1.02D	Section 92-1.02(C) and Section 39-1.02D
Asphalt modifier	Various	--	--	Section 39-1.02D	Section 39-1.02D
Crumb rubber modifier	Various	--	--	Section 39-1.02D	Section 39-1.02D

<sup>a</sup>The Engineer determines combined aggregate gradations containing RAP under Laboratory Procedure LP-9.

<sup>b</sup>The tolerances must comply with the allowable tolerances in Section 39-1.02E, "Aggregate."

<sup>c</sup>The Engineer reports the average of 3 tests from a single split sample.

<sup>d</sup>Modify California Test 304, Part 2.B.2.c: "After compaction in the mechanical compactor, cool to 60 °C ± 3 °C by allowing the briquettes to cool at room temperature for 0.5 hour, then place the briquettes in the oven at 69 °C for a minimum of 2 hours and not more than 3 hours."

<sup>e</sup>The Engineer determines the bulk specific gravity of each lab-compacted briquette under California Test 308, Method A, and theoretical maximum specific gravity under California Test 309.

<sup>f</sup>Report only if the adjustment for asphalt binder content target value is less than or equal to ± 0.3 percent from OBC.

<sup>g</sup>Voids in mineral aggregate for RHMA-G must be within this range.

No single test result may represent more than the smaller of 750 tonnes or 1 day's production.

For any single quality characteristic except smoothness, if 2 consecutive acceptance test results do not comply with the specifications:

1. Stop production.
2. Take corrective action.
3. In the Engineer's presence, take samples and split each sample into 4 parts. Test 1 part for compliance with the specifications and submit 3 parts to the Engineer. The Engineer tests 1 part for compliance with the specifications and reserves and stores 2 parts.
4. Demonstrate compliance with the specifications before resuming production and placement on the State highway.

### 39-3.03 SPREADING AND COMPACTING EQUIPMENT

Each paver spreading HMA Type A and Type B must be followed by 3 rollers:

1. One vibratory roller specifically designed to compact HMA. The roller must be capable of at least 2500 vibrations per minute and must be equipped with amplitude and frequency controls. The roller's gross static mass must be at least 6.8 tonnes.
2. One oscillating type pneumatic-tired roller at least 1.2 m wide. Pneumatic tires must be of equal size, diameter, type, and ply. The tires must be inflated to 415 kilopascals minimum and maintained so that the air pressure does not vary more than 35 kilopascals.
3. One steel-tired, 2-axle tandem roller. The roller's gross static mass must be at least 6.8 tonnes.

Each roller must have a separate operator. Rollers must be self-propelled and reversible.

Compact RHMA-G under the specifications for compacting HMA Type A and Type B except do not use pneumatic-tired rollers.

Compact OGFC with steel-tired, 2-axle tandem rollers. If placing over 275 tonnes of OGFC per hour, use at least 3 rollers for each paver. If placing less than 275 tonnes of OGFC per hour, use at least 2 rollers for each paver. Each roller must weigh between 2250 kilograms to 3075 kilograms per linear meter of drum width. Turn the vibrator off.

### 39-3.04 TRANSPORTING, SPREADING, AND COMPACTING

Pave HMA in maximum 75-millimeter thick compacted layers.

If the surface to be paved is both in sunlight and shade, pavement surface temperatures are taken in the shade.

Spread HMA Type A and Type B only if atmospheric and surface temperatures are:

### Minimum Atmospheric and Surface Temperatures

Compacted Layer Thickness, mm				
	Unmodified Asphalt Binder	Modified Asphalt Binder <sup>a</sup>	Unmodified Asphalt Binder	Modified Asphalt Binder <sup>a</sup>
< 45	12.8	10	15.6	12.8
45 – 75	7.2	7.2	10	10

Note:

<sup>a</sup> Except asphalt rubber binder.

If the asphalt binder for HMA Type A and Type B is:

1. Unmodified asphalt binder, complete:

- 1.1. First coverage of breakdown compaction before the surface temperature drops below 120 °C
- 1.2. Breakdown and intermediate compaction before the surface temperature drops below 95 °C
- 1.3. Finish compaction before the surface temperature drops below 65 °C

2. Modified asphalt binder, complete:

- 2.1. First coverage of breakdown compaction before the surface temperature drops below 115 °C
- 2.2. Breakdown and intermediate compaction before the surface temperature drops below 85 °C
- 2.3. Finish compaction before the surface temperature drops below 60 °C

For RHMA-G:

1. Only spread and compact if the atmospheric temperature is at least 12.8 °C and the surface temperature is at least 15.6 °C.
2. Complete the first coverage of breakdown compaction before the surface temperature drops below 140 °C.
3. Complete breakdown and intermediate compaction before the surface temperature drops below 120 °C.
4. Complete finish compaction before the surface temperature drops below 95 °C.
5. If the atmospheric temperature is below 21 °C, cover loads in trucks with tarpaulins. The tarpaulins must completely cover the exposed load until you transfer the mixture to the paver's hopper or to the pavement surface.

For OGFC with unmodified asphalt binder:

1. Only spread and compact if the atmospheric temperature is at least 12.8 °C and the surface temperature is at least 15.6 °C.
2. Complete first coverage using 2 rollers before the surface temperature drops below 115 °C.
3. Complete all compaction before the surface temperature drops below 95 °C.
4. If the atmospheric temperature is below 21 °C, cover loads in trucks with tarpaulins. The tarpaulins must completely cover the exposed load until you transfer the mixture to the paver's hopper or to the pavement surface.

For OGFC with modified asphalt binder except asphalt rubber binder:

1. Only spread and compact if the atmospheric temperature is at least 10 °C and the surface temperature is at least 10 °C.
2. Complete first coverage using 2 rollers before the surface temperature drops below 115 °C.
3. Complete all compaction before the surface temperature drops below 85 °C.
4. If the atmospheric temperature is below 21 °C, cover loads in trucks with tarpaulins. The tarpaulins must completely cover the exposed load until you transfer the mixture to the paver's hopper or to the pavement surface.

For RHMA-O and RHMA-O-HB:

1. Only spread and compact if the atmospheric temperature is at least 12.8 °C and surface temperature is at least 15.6 °C.
2. Complete the 1st coverage using 2 rollers before the surface temperature drops below 140 °C.



3. Complete compaction before the surface temperature drops below 120 °C.
4. If the atmospheric temperature is below 21 °C, cover loads in trucks with tarpaulins. The tarpaulins must completely cover the exposed load until the mixture is transferred to the paver's hopper or to the pavement surface.

For RHMA-G and OGFC, tarpaulins are not required if the time from discharge to truck until transfer to the paver's hopper or the pavement surface is less than 30 minutes.

HMA compaction coverage is the number of passes needed to cover the paving width. A pass is 1 roller's movement parallel to the paving in either direction. Overlapping passes are part of the coverage being made and are not a subsequent coverage. Do not start a coverage until completing the prior coverage.

Start rolling at the lower edge and progress toward the highest part.

Perform breakdown compaction of each layer of HMA Type A, Type B, and RHMA-G with 3 coverages using a vibratory roller. The speed of the vibratory roller in kilometers per hour must not exceed the vibrations per minute divided by 1600. If the HMA layer thickness is less than 25 mm, turn the vibrator off. The Engineer may order fewer coverages if the HMA layer thickness is less than 45 mm.

Perform intermediate compaction of each layer of HMA Type A and Type B with 3 coverages using a pneumatic-tired roller at a speed not to exceed 8 kilometers per hour.

Perform finish compaction of HMA Type A, Type B, and RHMA-G with 1 coverage using a steel-tired roller.

Compact OGFC with 2 coverages using steel-tired rollers.

### **39-4 QUALITY CONTROL / QUALITY ASSURANCE**

#### **39-4.01 DESCRIPTION**

If HMA is specified as Quality Control / Quality Assurance, construct it under Section 39-1, "General," this Section 39-4, "Quality Control / Quality Assurance," and Section 39-5, "Measurement and Payment."

#### **39-4.02 GENERAL**

The QC / QA construction process consists of:

1. Establishing, maintaining, and changing if needed a quality control system providing assurance the HMA complies with the specifications
2. Sampling and testing at specified intervals, or sublots, to demonstrate compliance and to control process
3. The Engineer sampling and testing at specified intervals to verify testing process and HMA quality
4. The Engineer using test results, statistical evaluation of verified quality control tests, and inspection to accept HMA for payment

A lot is a quantity of HMA. The Engineer designates a new lot when:

1. 20 sublots are complete
2. The JMF changes
3. Production stops for more than 30 days

Each lot consists of no more than 20 sublots. A subplot is 750 tonnes except HMA paved at day's end greater than 250 tonnes is a subplot. If HMA paved at day's end is less than 250 tonnes, you may either make this quantity a subplot or include it in the previous subplot's test results for statistical evaluation.

#### **39-4.03 CONTRACTOR QUALITY CONTROL**

##### **39-4.03A General**

Use a composite quality factor,  $QF_C$ , and individual quality factors,  $QF_{QC_i}$ , to control your process and evaluate your quality control program. For quality characteristics without quality factors, use your quality control plan's action limits to control process.

Control HMA quality including:

1. Materials
2. Proportioning
3. Spreading and compacting
4. Finished roadway surface

Develop, implement, and maintain a quality control program that includes:

1. Inspection
2. Sampling
3. Testing

#### **39-4.03B Quality Control Plan**

With the JMF submittal, submit a written Quality Control Plan (QCP). The QCP must comply with the Department's Quality Control Manual for Hot Mix Asphalt Production and Placement. Discuss the QCP with the Engineer during the prepaving conference.

The Engineer reviews each QCP within 5 business days from the submittal. Hold HMA production until the Engineer accepts the QCP in writing. The Engineer's QCP acceptance does not mean your compliance with the QCP will result in acceptable HMA. Section 39-1.05, "Engineer's Acceptance," specifies HMA acceptance.

The QCP must include the name and qualifications of a Quality Control Manager. The Quality Control Manager administers the QCP and during paving must be at the job site within 3 hours of receiving notice. The Quality Control Manager must not be any of the following on the project:

1. Foreman
2. Production or paving crewmember
3. Inspector
4. Tester

The QCP must include action limits and details of corrective action you will take if a test result for any quality characteristic falls outside an action limit.

As work progresses, you must submit a written QCP supplement to change quality control procedures, personnel, tester qualification status, or laboratory accreditation status.

#### **39-4.03C Quality Control Inspection, Sampling, And Testing**

Sample, test, inspect, and manage HMA quality control.

Provide a roadway inspector while HMA paving activities are in progress. Provide a plant inspector during HMA production.

Inspectors must comply with the Department's Quality Control Manual for Hot Mix Asphalt Production and Placement.

Provide a testing laboratory and personnel for quality control testing. Provide the Engineer unrestricted access to the quality control activities. Before providing services for the project, the Engineer reviews, accredits, and qualifies the testing laboratory and personnel under the Department's Independent Assurance Program.

The minimum random sampling and testing for quality control is:

**Minimum Quality Control – QC / QA**

Quality Characteristic	Test Method	Min-imum Sampling and Testing Frequency	HMA Type			Location of Sampling	Max. Reporting Time Allowance
			A	B	RHMA-G		
Aggregate gradation <sup>a</sup>	CT 202	1 per 750 tonnes	JMF ± Tolerance <sup>b</sup>	JMF ± Tolerance <sup>b</sup>	JMF ± Tolerance <sup>b</sup>	CT 125	24 hours
Asphalt binder content (%)	CT 379 or 382		JMF ±0.45	JMF ±0.45	JMF ±0.5	Loose Mix Behind Paver See CT 125	
Percent of maximum theoretical density (%) <sup>c, d</sup>	QC Plan		92 - 96	92 - 96	91 - 96	QC Plan	
Aggregate moisture content at continuous mixing plants and RAP moisture content at continuous mixing plants and batch mixing plants <sup>e</sup>	CT 226 or CT 370	2 per day during production	--	--	--	Stock-piles or cold feed belts	--
Sand equivalent (min.) <sup>f</sup>	CT 217	1 per 750 tonnes	47	42	47	CT 125	24 hours
HMA moisture content (% max.)	CT 226 or CT 370	1 per 2500 tonnes but not less than 1 per paving day	1.0	1.0	1.0	Loose Mix Behind Paver See CT 125	24 hours
Stabilometer Value (min.) <sup>f, g</sup> 4.75-mm and 9.5-mm gradings 12.5-mm and 19-mm gradings	CT 366	1 per 4000 tonnes or 2 per 5 business days, whichever is more	30 37	30 35	-- 23		48 hours
Air voids content (%) <sup>f, h</sup>	CT 367		4 ± 2	4 ± 2	Specification ± 2		

Percent of crushed particles coarse aggregate (% min.) One fractured face Two fractured faces Fine aggregate (% min.) (Passing 4.75-mm sieve and retained on 2.36-mm sieve.) One fractured face	CT 205	As necessary and designated in QCP. At least once per project.	90 75 70	25 -- 20	-- 90 70	CT 125	48 hours
Los Angeles Rattler (% max.) Loss at 100 rev. Loss at 500 rev.	CT 211		12 45	-- 50	12 40	CT 125	
Fine aggregate angularity (% min.)	AASHTO T 304, Method A		45	45	45	CT 125	
Flat and elongated particle (% max. by mass @ 5:1)	ASTM D 4791		Report only	Report only	Report only	CT 125	
Voids filled with asphalt (%) <sup>i</sup> 4.75-mm grading 9.5-mm grading 12.5-mm grading 19-mm grading	LP-3		76.0 – 80.0 73.0 – 76.0 65.0 – 75.0 65.0 – 75.0	76.0 – 80.0 73.0 – 76.0 65.0 – 75.0 65.0 – 75.0	Report only	LP-3	
Voids in mineral aggregate (% min.) <sup>i</sup> 4.75-mm grading 9.5-mm grading 12.5-mm grading 19-mm grading	LP-2		17.0 15.0 14.0 13.0	17.0 15.0 14.0 13.0	-- -- 18.0 – 23.0 <sup>j</sup> 18.0 – 23.0 <sup>j</sup>	LP-2	
Dust proportion <sup>1</sup> 4.75-mm and 9.5-mm gradings 12.5-mm and 19-mm gradings	LP-4		0.9 – 2.0 0.6 – 1.3	0.9 – 2.0 0.6 – 1.3	Report only	LP-4	
Smoothness	Section 39-1.12	--	3.66-m straight-edge, must-grind, and PI <sub>0</sub>	3.66-m straight-edge, must-grind, and PI <sub>0</sub>	3.66-m straight-edge, must-grind, and PI <sub>0</sub>	--	
Asphalt rubber binder viscosity @ 177 °C, centipoises	Section 39-1.02D	--	--	--	1500 – 4000	Section 39-1.02D	24 hours
Crumb rubber modifier	Section 39-1.02D	--	--	--	Section 39-1.02D	Section 39-1.02D	48 hours

Notes:

<sup>a</sup> Determine combined aggregate gradation containing RAP under Laboratory Procedure LP-9.

<sup>b</sup> The tolerances must comply with the allowable tolerances in Section 39-1.02E, "Aggregate."

<sup>c</sup> Required for HMA Type A, Type B, and RHMA-G if the specified paved thickness is at least 45 mm.

<sup>d</sup> Determine maximum theoretical density (California Test 309) at the frequency specified for test maximum density under California Test 375, Part 5 D.

<sup>e</sup> For adjusting the plant controller at the HMA plant.

<sup>f</sup> Report the average of 3 tests from a single split sample.

<sup>g</sup> Modify California Test 304, Part 2.B.2.c: "After compaction in the mechanical compactor, cool to  $60^{\circ}\text{C} \pm 3^{\circ}\text{C}$  by allowing the briquettes to cool at room temperature for 0.5 hour, then place the briquettes in the oven at  $69^{\circ}\text{C}$  for a minimum of 2 hours and not more than 3 hours."

<sup>h</sup> Determine the bulk specific gravity of each lab-compacted briquette under California Test 308, Method A, and theoretical maximum specific gravity under California Test 309.

<sup>i</sup> Report only if the adjustment for asphalt binder content target value is less than or equal to  $\pm 0.3$  percent from OBC

<sup>j</sup> Voids in mineral aggregate for RHMA-G must be within this range.

Within the specified reporting time, submit written test results including:

1. Sampling location, quantity, and time
2. Testing results
3. Supporting data and calculations

If test results for any quality characteristic are beyond the action limits in the QCP, take corrective actions. Document the corrective actions taken in the inspection records under Section 39-4.03E, "Records of Inspection and Testing."

Stop production, notify the Engineer in writing, take corrective action, and demonstrate compliance with the specifications before resuming production and placement on the State highway if:

1. A lot's composite quality factor,  $Q_{FC}$ , or an individual quality factor,  $Q_{F_{QCi}}$  for  $i = 3, 4$ , or  $5$ , is below  $0.90$  determined under Section 39-4.03F, "Statistical Evaluation"
2. An individual quality factor,  $Q_{F_{QCi}}$  for  $i = 1$  or  $2$ , is below  $0.75$
3. Quality characteristics for which a quality factor,  $Q_{F_{QCi}}$ , is not determined has 2 consecutive acceptance or quality control tests not in compliance with the specifications

#### **39-4.03D Charts And Records**

Record sampling and testing results for quality control on forms provided in the "Quality Control Manual for Hot Mix Asphalt," or on forms you submit with the QCP. The QCP must also include form posting locations and submittal times.

Submit quality control test results using the Department's statistical evaluation program, HMAPay, available at

[www.dot.ca.gov/hq/construc/hma/index.htm](http://www.dot.ca.gov/hq/construc/hma/index.htm)

#### **39-4.03E Records Of Inspection And Testing**

During HMA production, submit in writing a daily:

1. HMA Construction Daily Record of Inspection. Also make this record available at the HMA plant and job site each day.
2. HMA Inspection and Testing Summary. Include in the summary:
  - 2.1. Test forms with the testers' signatures and Quality Control Manager's initials.
  - 2.2. Inspection forms with the inspectors' signatures and Quality Control Manager's initials.
  - 2.3. A list and explanation of deviations from the specifications or regular practices.
  - 2.4. A signed statement by the Quality Control Manager that says:

"It is hereby certified that the information contained in this record is accurate, and that information, tests, or calculations documented herein comply with the specifications of the contract and the standards set forth in the testing procedures. Exceptions to this certification are documented as part of this record."

Retain for inspection the records generated as part of quality control including inspection, sampling, and testing for at least 3 years after final acceptance.

### 39-4.03F Statistical Evaluation

#### General

Determine a lot's composite quality factor,  $QF_C$ , and the individual quality factors,  $QF_{QC_i}$ . Perform statistical evaluation calculations to determine these quality factors based on quality control test results for:

1. Aggregate gradation
2. Asphalt binder content
3. Percent of maximum theoretical density

The Engineer grants a waiver and you must use 1.0 as the individual quality factor for percent of maximum theoretical density,  $QF_{QC5}$ , for HMA paved in:

1. Areas where the specified paved thickness is less than 45 mm
2. Areas where the specified paved thickness is less than 60 mm and a 19-millimeter grading is specified and used
3. Dig outs
4. Leveling courses
5. Areas where, in the opinion of the Engineer, compaction or compaction measurement by conventional methods is impeded

#### Statistical Evaluation Calculations

Use the Variability-Unknown / Standard Deviation Method to determine the percentage of a lot not in compliance with the specifications. The number of significant figures used in the calculations must comply with AASHTO R-11, Absolute Method.

Determine the percentage of work not in compliance with the specification limits for each quality characteristic as follows:

1. Calculate the arithmetic mean ( $\bar{X}$ ) of the test values

$$\bar{X} = \frac{\sum x}{n}$$

where:

$x$  = individual test values  
 $n$  = number of test values

2. Calculate the standard deviation

$$s = \sqrt{\frac{n(\sum x^2) - (\sum x)^2}{n(n-1)}}$$

where:

$\sum(x^2)$  = sum of the squares of individual test values  
 $(\sum x)^2$  = sum of the individual test values squared  
 $n$  = number of test values

3. Calculate the upper quality index ( $Q_u$ )

$$Q_u = \frac{USL - \bar{X}}{s}$$

where:

$USL$  = target value plus the production tolerance or upper specification limit  
 $s$  = standard deviation  
 $\bar{X}$  = arithmetic mean

4. Calculate the lower quality index ( $Q_L$ );

$$Q_L = \frac{\bar{X} - LSL}{s}$$

where:

LSL = target value minus production tolerance or lower specification limit  
s = standard deviation  
 $\bar{X}$  = arithmetic mean

5. From the table, Upper Quality Index  $Q_U$  or Lower Quality Index  $Q_L$ , of this Section 39-4.03F, "Statistical Evaluation", determine  $P_U$  ;

where:

$P_U$  = the estimated percentage of work outside the USL.  
 $P_U = 0$ , when USL is not specified.

6. From the table, Upper Quality Index  $Q_U$  or Lower Quality Index  $Q_L$ , of this Section 39-4.03F, "Statistical Evaluation," determine  $P_L$ ;

where:

$P_L$  = the estimated percentage of work outside the LSL.  
 $P_L = 0$ , when LSL is not specified.

7. Calculate the total estimated percentage of work outside the USL and LSL, percent defective

$$\text{Percent defective} = P_U + P_L$$

$P_U$  and  $P_L$  are determined from:

P <sub>U</sub> or P <sub>L</sub>	Upper Quality Index Q <sub>U</sub> or Lower Quality Index Q <sub>L</sub>												
	Sample Size (n)												
	5	6	7	8	9	10-11	12-14	15-17	18-22	23-29	30-42	43-66	>66
0	1.72	1.88	1.99	2.07	2.13	2.20	2.28	2.34	2.39	2.44	2.48	2.51	2.56
1	1.64	1.75	1.82	1.88	1.91	1.96	2.01	2.04	2.07	2.09	2.12	2.14	2.16
2	1.58	1.66	1.72	1.75	1.78	1.81	1.84	1.87	1.89	1.91	1.93	1.94	1.95
3	1.52	1.59	1.63	1.66	1.68	1.71	1.73	1.75	1.76	1.78	1.79	1.80	1.81
4	1.47	1.52	1.56	1.58	1.60	1.62	1.64	1.65	1.66	1.67	1.68	1.69	1.70
5	1.42	1.47	1.49	1.51	1.52	1.54	1.55	1.56	1.57	1.58	1.59	1.59	1.60
6	1.38	1.41	1.43	1.45	1.46	1.47	1.48	1.49	1.50	1.50	1.51	1.51	1.52
7	1.33	1.36	1.38	1.39	1.40	1.41	1.41	1.42	1.43	1.43	1.44	1.44	1.44
8	1.29	1.31	1.33	1.33	1.34	1.35	1.35	1.36	1.36	1.37	1.37	1.37	1.38
9	1.25	1.27	1.28	1.28	1.29	1.29	1.30	1.30	1.30	1.31	1.31	1.31	1.31
10	1.21	1.23	1.23	1.24	1.24	1.24	1.25	1.25	1.25	1.25	1.25	1.26	1.26
11	1.18	1.18	1.19	1.19	1.19	1.19	1.20	1.20	1.20	1.20	1.20	1.20	1.20
12	1.14	1.14	1.15	1.15	1.15	1.15	1.15	1.15	1.15	1.15	1.15	1.15	1.15
13	1.10	1.10	1.10	1.10	1.10	1.10	1.11	1.11	1.11	1.11	1.11	1.11	1.11
14	1.07	1.07	1.07	1.06	1.06	1.06	1.06	1.06	1.06	1.06	1.06	1.06	1.06
15	1.03	1.03	1.03	1.03	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02
16	1.00	0.99	0.99	0.99	0.99	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
17	0.97	0.96	0.95	0.95	0.95	0.95	0.94	0.94	0.94	0.94	0.94	0.94	0.94
18	0.93	0.92	0.92	0.92	0.91	0.91	0.91	0.91	0.90	0.90	0.90	0.90	0.90
19	0.90	0.89	0.88	0.88	0.88	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87
20	0.87	0.86	0.85	0.85	0.84	0.84	0.84	0.83	0.83	0.83	0.83	0.83	0.83
21	0.84	0.82	0.82	0.81	0.81	0.81	0.80	0.80	0.80	0.80	0.80	0.80	0.79
22	0.81	0.79	0.79	0.78	0.78	0.77	0.77	0.77	0.76	0.76	0.76	0.76	0.76
23	0.77	0.76	0.75	0.75	0.74	0.74	0.74	0.73	0.73	0.73	0.73	0.73	0.73
24	0.74	0.73	0.72	0.72	0.71	0.71	0.70	0.70	0.70	0.70	0.70	0.70	0.70
25	0.71	0.70	0.69	0.69	0.68	0.68	0.67	0.67	0.67	0.67	0.67	0.67	0.66
26	0.68	0.67	0.67	0.65	0.65	0.65	0.64	0.64	0.64	0.64	0.64	0.64	0.63
27	0.65	0.64	0.63	0.62	0.62	0.62	0.61	0.61	0.61	0.61	0.61	0.61	0.60
28	0.62	0.61	0.60	0.59	0.59	0.59	0.58	0.58	0.58	0.58	0.58	0.58	0.57
29	0.59	0.58	0.57	0.57	0.56	0.56	0.55	0.55	0.55	0.55	0.55	0.55	0.54
30	0.56	0.55	0.54	0.54	0.53	0.53	0.52	0.52	0.52	0.52	0.52	0.52	0.52
31	0.53	0.52	0.51	0.51	0.50	0.50	0.50	0.49	0.49	0.49	0.49	0.49	0.49
32	0.50	0.49	0.48	0.48	0.48	0.47	0.47	0.47	0.46	0.46	0.46	0.46	0.46
33	0.47	0.48	0.45	0.45	0.45	0.44	0.44	0.44	0.44	0.43	0.43	0.43	0.43
34	0.45	0.43	0.43	0.42	0.42	0.42	0.41	0.41	0.41	0.41	0.41	0.41	0.40
35	0.42	0.40	0.40	0.39	0.39	0.39	0.38	0.38	0.38	0.38	0.38	0.38	0.38
36	0.39	0.38	0.37	0.37	0.36	0.36	0.36	0.36	0.36	0.36	0.36	0.36	0.36
37	0.36	0.35	0.34	0.34	0.34	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.32
38	0.33	0.32	0.32	0.31	0.31	0.31	0.30	0.30	0.30	0.30	0.30	0.30	0.30
39	0.30	0.30	0.29	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28
40	0.28	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
41	0.25	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23
42	0.23	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20
43	0.18	0.18	0.18	0.18	0.18	0.18	0.18	0.18	0.18	0.18	0.18	0.18	0.18
44	0.16	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15
45	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13
46	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
47	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08
48	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
49	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03
50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

1. If the value of Q<sub>U</sub> or Q<sub>L</sub> does not correspond to a value in the table, use the next lower value.
2. If Q<sub>U</sub> or Q<sub>L</sub> are negative values, P<sub>U</sub> or P<sub>L</sub> is equal to 100 minus the table value for P<sub>U</sub> or P<sub>L</sub>.



### Quality Factor Determination

Determine individual quality factors,  $QF_{QC_i}$ , using percent defective =  $P_U + P_L$  and:

Quality Factor	Quality Factors												
	Maximum Allowable Percent Defective ( $P_U + P_L$ )												
	Sample Size (n)												
	5	6	7	8	9	10-11	12-14	15-17	18-22	23-29	30-42	43-66	>66
1.05				0	0	0	0	0	0	0	0	0	0
1.04			0	1	3	5	4	4	4	3	3	3	3
1.03		0	2	4	6	8	7	7	6	5	5	4	4
1.02		1	3	6	9	11	10	9	8	7	7	6	6
1.01	0	2	5	8	11	13	12	11	10	9	8	8	7
1.00	22	20	18	17	16	15	14	13	12	11	10	9	8
0.99	24	22	20	19	18	17	16	15	14	13	11	10	9
0.98	26	24	22	21	20	19	18	16	15	14	13	12	10
0.97	28	26	24	23	22	21	19	18	17	16	14	13	12
0.96	30	28	26	25	24	22	21	19	18	17	16	14	13
0.95	32	29	28	26	25	24	22	21	20	18	17	16	14
0.94	33	31	29	28	27	25	24	22	21	20	18	17	15
0.93	35	33	31	29	28	27	25	24	22	21	20	18	16
0.92	37	34	32	31	30	28	27	25	24	22	21	19	18
0.91	38	36	34	32	31	30	28	26	25	24	22	21	19
0.90	39	37	35	34	33	31	29	28	26	25	23	22	20
0.89	41	38	37	35	34	32	31	29	28	26	25	23	21
0.88	42	40	38	36	35	34	32	30	29	27	26	24	22
0.87	43	41	39	38	37	35	33	32	30	29	27	25	23
0.86	45	42	41	39	38	36	34	33	31	30	28	26	24
0.85	46	44	42	40	39	38	36	34	33	31	29	28	25
0.84	47	45	43	42	40	39	37	35	34	32	30	29	27
0.83	49	46	44	43	42	40	38	36	35	33	31	30	28
0.82	50	47	46	44	43	41	39	38	36	34	33	31	29
0.81	51	49	47	45	44	42	41	39	37	36	34	32	30
0.80	52	50	48	46	45	44	42	40	38	37	35	33	31
0.79	54	51	49	48	46	45	43	41	39	38	36	34	32
0.78	55	52	50	49	48	46	44	42	41	39	37	35	33
0.77	56	54	52	50	49	47	45	43	42	40	38	36	34
0.76	57	55	53	51	50	48	46	44	43	41	39	37	35
0.75	58	56	54	52	51	49	47	46	44	42	40	38	36
Reject	60	57	55	53	52	51	48	47	45	43	41	40	37
	61	58	56	55	53	52	50	48	46	44	43	41	38
	62	59	57	56	54	53	51	49	47	45	44	42	39
	63	61	58	57	55	54	52	50	48	47	45	43	40
	64	62	60	58	57	55	53	51	49	48	46	44	41

Reject Values Greater Than Those Shown Above

Notes:

- To obtain a quality factor when the estimated percent outside specification limits from table, "Upper Quality Index  $Q_U$  or Lower Quality Index  $Q_L$ ," does not correspond to a value in the table, use the next larger value.

Compute the composite of single quality factors,  $QF_C$ , for a lot using:

$$QF_C = \sum_{i=1}^5 w_i QF_{QC_i}$$

where:

$QF_C$  = the composite quality factor for the lot rounded to 2 decimal places.  
 $QF_{QC_i}$  = the quality factor for the individual quality characteristic.  
 $w$  = the weighting factor listed in the table HMA Acceptance – QC / QA.

$i =$  the quality characteristic index number in the table HMA Acceptance – QC / QA.

### 39-4.04 ENGINEER'S QUALITY ASSURANCE

#### 39-4.04A General

The Engineer assures quality by:

1. Reviewing mix designs and proposed JMF
2. Inspecting procedures
3. Conducting oversight of quality control inspection and records
4. Verification sampling and testing during production and paving

#### 39-4.04B Verification Sampling And Testing

##### General

The Engineer samples:

1. Aggregate to verify gradation
2. HMA to verify asphalt binder content

##### Verification

For aggregate gradation and asphalt binder content, the ratio of verification testing frequency to the minimum quality control testing frequency is 1:5. The Engineer performs at least 3 verification tests per lot.

Using the t-test, the Engineer compares quality control tests results for aggregate gradation and asphalt binder content with corresponding verification test results. The Engineer uses the average and standard deviation of up to 20 sequential sublots for the comparison. The Engineer uses production start-up evaluation tests to represent the first subplot. When there are less than 20 sequential sublots, the Engineer uses the maximum number of sequential sublots available. The 21st subplot becomes the 1st subplot ( $n = 1$ ) in the next lot.

The t-value for a group of test data is computed as follows:

$$t = \frac{|\bar{X}_c - \bar{X}_v|}{S_p \sqrt{\frac{1}{n_c} + \frac{1}{n_v}}} \quad \text{and} \quad S_p^2 = \frac{S_c^2(n_c - 1) + S_v^2(n_v - 1)}{n_c + n_v - 2}$$

where:

- $n_c$  = Number of quality control tests (2 minimum, 20 maximum).
- $n_v$  = Number of verification tests (minimum of 1 required).
- $\bar{X}_c$  = Mean of quality control tests.
- $\bar{X}_v$  = Mean of verification tests.
- $S_p$  = Pooled standard deviation (When  $n_v = 1$ ,  $S_p = S_c$ ).
- $S_c$  = Standard deviation of quality control tests.
- $S_v$  = Standard deviation of verification tests (when  $n_v > 1$ ).

The comparison of quality control test results and the verification test results is at a level of significance of  $\alpha = 0.025$ . The Engineer computes t and compares it to the critical t-value,  $t_{crit}$ , from:

**Critical T-Value**

Degrees of freedom ( $n_c+n_v-2$ )	$t_{crit}$ (for $\alpha = 0.025$ )	Degrees of freedom ( $n_c+n_v-2$ )	$t_{crit}$ (for $\alpha = 0.025$ )
1	24.452	18	2.445
2	6.205	19	2.433
3	4.177	20	2.423
4	3.495	21	2.414
5	3.163	22	2.405
6	2.969	23	2.398
7	2.841	24	2.391
8	2.752	25	2.385
9	2.685	26	2.379
10	2.634	27	2.373
11	2.593	28	2.368
12	2.560	29	2.364
13	2.533	30	2.360
14	2.510	40	2.329
15	2.490	60	2.299
16	2.473	120	2.270
17	2.458	$\infty$	2.241

If the t-value computed is less than or equal to  $t_{crit}$ , quality control test results are verified.

If the t-value computed is greater than  $t_{crit}$  and both  $\bar{X}_v$  and  $\bar{X}_c$  comply with acceptance specifications, the quality control tests are verified. You may continue to produce and place HMA with the following allowable differences:

1.  $|\bar{X}_v - \bar{X}_c| \leq 1.0$  percent for any grading
2.  $|\bar{X}_v - \bar{X}_c| \leq 0.1$  percent for asphalt binder content

If the t-value computed is greater than  $t_{crit}$  and the  $|\bar{X}_v - \bar{X}_c|$  for grading and asphalt binder content are greater than the allowable differences, quality control test results are not verified and:

1. The Engineer notifies you in writing.
2. You and the Engineer must investigate why the difference exist.
3. If the reason for the difference cannot be found and corrected, the Engineer's test results are used for acceptance and pay.

### **39-4.05 ENGINEER'S ACCEPTANCE**

#### **39-4.05A Testing**

The Engineer samples for acceptance testing and tests for:

**HMA Acceptance – QC / QA**

Index (i)	Quality Characteristic				Weight -ing Factor (w)	Test Method	HMA Type		
							A	B	RHMA-G
		Aggregate gradation <sup>a</sup>					JMF ± Tolerance <sup>c</sup>		
	Sieve	19- mm	12.5- mm	9.5- mm		CT 202			
1	12.5-mm	X <sup>b</sup>	--	--	0.05				
1	9.5-mm	--	X	--	0.05				
1	4.75-mm	--	--	X	0.05				
2	2.36-mm	X	X	X	0.10				
3	0.075-mm	X	X	X	0.15				
4	Asphalt binder content (%)				0.30	CT 379 or 382	JMF ± 0.45	JMF ± 0.45	JMF ± 0.5
5	Percent of maximum theoretical density (%) <sup>d, e</sup>				0.40	CT 375	92 – 96	92 – 96	91 – 96
	Sand equivalent (min.) <sup>f</sup>					CT 217	47	42	47
	Stabilometer value (min.) <sup>f, g</sup>					CT 366			
	4.75-mm and 9.5-mm gradings						30	30	--
	12.5-mm and 19-mm gradings						37	35	23
	Air voids content (%) <sup>f, h</sup>					CT 367	4 ± 2	4 ± 2	Specifica- tion ± 2
	Percent of crushed particles coarse aggregate (% min.)					CT 205			
	One fractured face						90	25	--
	Two fractured faces						70	--	90
	Fine aggregate (% min.)								
	(Passing 4.75-mm sieve and retained on 2.36-mm sieve.)								
	One fractured face						70	20	70
	HMA moisture content (% max.)					CT 226 or CT 370	1.0	1.0	1.0
	Los Angeles Rattler (% max.)					CT 211			
	Loss at 100 rev.						12	--	12
	Loss at 500 rev.						45	50	45
	Fine aggregate angularity (% min.)					AASHTO T 304, Method A	45	45	45
	Flat and elongated particle (% max. by mass @ 5:1)					ASTM D 4791	Report only	Report only	Report only
	Voids in mineral aggregate (% min.) <sup>i</sup>								(Note j)
	4.75-mm grading					LP-2	17.0	17.0	--
	9.5-mm grading						15.0	15.0	--
	12.5-mm grading						14.0	14.0	18.0 - 23.0
	19-mm grading						13.0	13.0	18.0 - 23.0
	Voids filled with asphalt (%) <sup>i</sup>								
	4.75-mm grading					LP-3	76.0 - 80.0	76.0 - 80.0	Report only
	9.5-mm grading						73.0 - 76.0	73.0 - 76.0	
	12.5-mm grading						65.0 - 75.0	65.0 - 75.0	
	19-mm grading						65.0 - 75.0	65.0 - 75.0	
	Dust proportion <sup>i</sup>					LP-4			
	4.75-mm and 9.5-mm gradings						0.9 - 2.0	0.9 - 2.0	Report only
	12.5-mm and 19-mm gradings						0.6 - 1.3	0.6 - 1.3	

	Smoothness		Section 39-1.12	3.66-m straight-edge, must-grind, and $PI_0$	3.66-m straight-edge, must-grind, and $PI_0$	3.66-m straight-edge, must-grind, and $PI_0$
	Asphalt binder		Various	Section 92	Section 92	Section 92
	Asphalt rubber binder		Various	--	--	Section 92-1.02(C) and Section 39-1.02D
	Asphalt modifier		Various	--	--	Section 39-1.02D
	Crumb rubber modifier		Various	--	--	Section 39-1.02D

Notes:

<sup>a</sup> The Engineer determines combined aggregate gradations containing RAP under Laboratory Procedure LP-9.

<sup>b</sup> "X" denotes the sieves the Engineer considers for the specified aggregate gradation.

<sup>c</sup> The tolerances must comply with the allowable tolerances in Section 39-1.02E, "Aggregate."

<sup>d</sup> The Engineer determines percent of maximum theoretical density if the specified paved thickness is at least 45 mm under California Test 375 except the Engineer uses:

1. California Test 308, Method A, to determine in-place density of each density core instead of using the nuclear gauge in Part 4, "Determining In-Place Density By The Nuclear Density Device."
2. California Test 309 to determine maximum theoretical density instead of calculating test maximum density in Part 5, "Determining Test Maximum Density."

<sup>e</sup> The Engineer determines maximum theoretical density (California Test 309) at the frequency specified for Test Maximum Density under California Test 375, Part 5.D.

<sup>f</sup> The Engineer reports the average of 3 tests from a single split sample.

<sup>g</sup> Modify California Test 304, Part 2.B.2.c: "After compaction in the mechanical compactor, cool to  $60\text{ }^{\circ}\text{C} \pm 3\text{ }^{\circ}\text{C}$  by allowing the briquettes to cool at room temperature for 0.5 hour, then place the briquettes in the oven at  $69\text{ }^{\circ}\text{C}$  for a minimum of 2 hours and not more than 3 hours."

<sup>h</sup> The Engineer determines the bulk specific gravity of each lab-compacted briquette under California Test 308, Method A, and theoretical maximum specific gravity under California Test 309.

<sup>i</sup> Report only if the adjustment for asphalt binder content target value is less than or equal to  $\pm 0.3$  percent from OBC.

<sup>j</sup> Voids in mineral aggregate for RHMA-G must be within this range.

The Engineer determines the percent of maximum theoretical density from the average density of 3 density cores you take from every 750 tonnes of production or part thereof divided by the maximum theoretical density.

If the specified total paved thickness is at least 45 mm and any layer is less than 45 mm, the Engineer determines the percent of maximum theoretical density from density cores taken from the final layer measured the full depth of the total paved HMA thickness.

The Engineer stops production and terminates a lot if:

1. The lot's composite quality factor,  $Q_{FC}$ , or an individual quality factor,  $Q_{F_{QC_i}}$  for  $i = 3, 4, \text{ or } 5$ , is below 0.90 determined under Section 39-4.03F, "Statistical Evaluation"
2. An individual quality factor,  $Q_{F_{QC_i}}$  for  $i = 1 \text{ or } 2$ , is below 0.75
3. Quality characteristics for which a quality factor,  $Q_{F_{QC_i}}$ , is not determined has 2 consecutive acceptance or quality control tests not in compliance with the specifications

For any single quality characteristic for which a quality factor,  $Q_{F_{QC_i}}$ , is not determined, except smoothness, if 2 consecutive acceptance test results do not comply with specifications:

1. Stop production.
2. Take corrective action.

3. In the Engineer's presence, take samples and split each sample into 4 parts. Test 1 part for compliance with the specifications and submit 3 parts to the Engineer. The Engineer tests 1 part for compliance with the specifications and reserves and stores 2 parts.
4. Demonstrate compliance with the specifications before resuming production and placement on the State highway.

### 39-4.05B Statistical Evaluation, Determination Of Quality Factors And Acceptance

#### Statistical Evaluation and Determination of Quality Factors

To determine the individual quality factor,  $QF_{QCi}$ , for any quality factor  $i = 1$  through 5 or a lot's composite quality factor,  $QF_C$ , for acceptance and payment adjustment, the Engineer uses the evaluation specifications under Section 39-4.03F, "Statistical Evaluation," and:

1. Verified quality control test results for aggregate gradation
2. Verified quality control test results for asphalt binder content
3. The Engineer's test results for percent of maximum theoretical density

#### Lot Acceptance Based on Quality Factors

The Engineer accepts a lot based on the quality factors determined for aggregate gradation and asphalt binder content,  $QF_{QCi}$  for  $i = 1$  through 4, using the total number of verified quality control test result values and the total percent defective ( $P_U + P_L$ ).

The Engineer accepts a lot based on the quality factor determined for maximum theoretical density,  $QF_{QC5}$ , using the total number of test result values from density cores and the total percent defective ( $P_U + P_L$ ).

The Engineer calculates the quality factor for the lot,  $QF_C$ , which is a composite of weighted individual quality factors,  $QF_{QCi}$ , determined for each quality characteristic in the HMA Acceptance – QC / QA table in Section 39-4.05A, "Testing."

The Engineer accepts a lot based on quality factors if:

1. The current composite quality factor,  $QF_C$ , is 0.90 or greater
2. Each individual quality factor,  $QF_{QCi}$  for  $i = 3, 4$ , and 5, is 0.90 or greater
3. Each individual quality factor,  $QF_{QCi}$  for  $i = 1$  and 2, is 0.75 or greater

No single quality characteristic test may represent more than the smaller of 750 tonnes or 1 day's production.

#### Payment Adjustment

If a lot is accepted, the Engineer adjusts payment with the following formula:

$$PA = \sum_{i=1}^n HMA CP * w_i * [QF_{QCi} * (HMATT - WHMATT_i) + WHMATT_i] - (HMA CP * HMATT)$$

where:

PA =	Payment adjustment rounded to 2 decimal places.
HMA CP =	HMA contract price.
HMATT =	HMA total tonnes represented in the lot.
WHMATT <sub>i</sub> =	Total tonnes of waived quality characteristic HMA.
QF <sub>QCi</sub> =	Running quality factor for the individual quality characteristic. QF <sub>QCi</sub> for $i = 1$ through 4 must be from verified Contractor's QC results. QF <sub>QC5</sub> must be determined from the Engineer's results on density cores taken for percent of maximum theoretical density determination.
w =	Weighting factor listed in the HMA acceptance table.
i =	Quality characteristic index number in the HMA acceptance table.

If the payment adjustment is a negative value, the Engineer deducts this amount from payment. If the payment adjustment is a positive value, the Engineer adds this amount to payment.

The 21st subplot becomes the 1st subplot ( $n = 1$ ) in the next lot. When the 21st sequential subplot becomes the 1st subplot, the previous 20 sequential subplots become a lot for which the Engineer determines a quality factor. The Engineer uses this quality factor to pay for the HMA in the lot. If the next lot consists of less than 8 sublots, these sublots must be added to the previous lot for quality factor determination using 21 to 27 sublots.

### **39-4.05C Dispute Resolution**

For a lot, if you or the Engineer dispute any quality factor,  $QF_{QCi}$ , or verification test result, every subplot in that lot must be retested.

Referee tests must be performed under the specifications for acceptance testing.

Any quality factor,  $QF_{QCi}$ , must be determined using the referee tests.

For any quality factor,  $QF_{QCi}$ , for  $i = 1$  through 5, dispute resolution:

1. If the difference between the quality factors for  $QF_{QCi}$  using the referee test result and the disputed test result is less than or equal to 0.01, the original test result is correct.
2. If the difference between the quality factor for  $QF_{QCi}$  using the referee test result and the disputed test result is more than 0.01, the quality factor determined from the referee tests supersedes the previously determined quality factor.

## **39-5 MEASUREMENT AND PAYMENT**

### **39-5.01 MEASUREMENT**

The contract item for HMA is measured by mass. The mass of each HMA mixture designated in the Engineer's Estimate must be the combined mixture mass.

If tack coat, asphalt binder, and asphaltic emulsion are paid with separate contract items, their contract items are measured under Section 92, "Asphalts," or Section 94, "Asphaltic Emulsions," as the case may be.

If recorded batch masses are printed automatically, the contract item for HMA is measured by using the printed batch masses, provided:

1. Total aggregate and supplemental fine aggregate mass per batch is printed. If supplemental fine aggregate is weighed cumulatively with the aggregate, the total aggregate batch mass must include the supplemental fine aggregate mass.
2. Total asphalt binder mass per batch is printed.
3. Each truckload's zero tolerance mass is printed before weighing the first batch and after weighing the last batch.
4. Time, date, mix number, load number and truck identification is correlated with a load slip.
5. A copy of the recorded batch mass is certified by a licensed weighmaster and submitted to the Engineer.

The contract item for placing HMA dike is measured by the meter along the completed length. The contract item for placing HMA in miscellaneous areas is measured as the in-place compacted area in square meters. In addition to the quantities measured on a meter or square meter basis, the HMA for dike and miscellaneous areas are measured by mass.

The contract item for geosynthetic pavement interlayer is measured by the square meter for the actual pavement area covered.

### **39-5.02 PAYMENT**

The contract prices paid per tonne for hot mix asphalt as designated in the Engineer's Estimate include full compensation for furnishing all labor, materials, tools, equipment, and incidentals for doing all the work involved in constructing hot mix asphalt, complete in place, as shown on the plans, as specified in these specifications and the special provisions, and as directed by the Engineer.

If HMA is specified to comply with Section 39-4, "Quality Control / Quality Assurance," the Engineer adjusts payment under that section.

Full compensation for the Quality Control Plan and prepaving conference is included in the contract prices paid per tonne for hot mix asphalt as designated in the Engineer's Estimate and no additional compensation will be allowed therefor.

Full compensation for performing and submitting mix designs and for Contractor sampling, testing, inspection, testing facilities, and preparation and submittal of results is included in the contract prices paid per tonne for HMA as designated in the Engineer's Estimate and no additional compensation will be allowed therefor.

Full compensation for reclaimed asphalt pavement is included in the contract prices paid per tonne for HMA as designated in the Engineer's Estimate and no additional compensation will be allowed therefor.

The contract price paid per tonne for hot mix asphalt (leveling) includes full compensation for furnishing all labor, materials, tools, equipment, and incidentals for doing all the work involved in hot mix asphalt (leveling), complete in place, as shown on the plans, as specified in these specifications and the special provisions, and as directed by the Engineer.





**(Issued 01-05-07)**

**Replace Section 40-1.05 with:**

## **SECTION 42 GROOVE AND GRIND PAVEMENT**

**(Issued 12-31-01)**

**In Section 42-2.02 in the 3rd paragraph in the 1st subparagraph, replace the last sentence with:**

After grinding has been completed, the pavement shall conform to the straightedge and profile requirements specified in Section 40-1.10, "Final Finishing."

^^

## **SECTION 49 PILING**

**(Issued 06-06-08)**

**In Section 49-1.03 replace the 1st paragraph with:**

Foundation piles of any material shall be of such length as is required to obtain the specified penetration, and to extend into the cap or footing block as shown on the plans, or specified in the special provisions.

**In Section 49-1.03 replace the 4th paragraph with:**

Modification to the specified installation methods and specified pile tip elevation will not be considered at locations where tension or lateral load demands control design pile tip elevations or when the plans state that specified pile tip elevation shall not be revised.

**In Section 49-1.03 replace the 6th and 7th paragraphs with:**

Indicator compression pile load testing shall conform to the requirements in ASTM Designation: D 1143-81. The pile shall sustain the first compression test load applied which is equal to the nominal resistance in compression, as shown on the plans, with no more than 13 mm total vertical movement at the top of the pile measured relative to the top of the pile prior to the start of compression load testing.

Indicator tension pile load testing shall conform to the requirements in ASTM Designation: D 3689-90. The loading apparatus described as "Load Applied to Pile by Hydraulic Jack(s) Acting at One End of Test Beam(s) Anchored to the Pile" shall not be used. The pile shall sustain the first tension test load applied which is equal to the nominal resistance in tension, as shown on the plans, with no more than 13 mm total vertical movement at the top of the pile measured relative to the top of the pile prior to the start of tension load testing.

**In Section 49-1.03 replace the 9th paragraph with:**

The Contractor shall furnish piling of sufficient length to obtain the specified tip elevation shown on the plans or specified in the special provisions.

**In Section 49-1.03, delete the 10th paragraph**

**In Section 49-1.04 replace the 4th, 5th, and 6th paragraphs with:**

Load test piles and anchor piles which are not to be incorporated in the completed structure shall be removed in conformance with the provisions in Section 15-4.02, "Removal Methods," and the remaining holes shall be backfilled with earth or other suitable material approved by the Engineer.

Load test anchorages in piles used as anchor piles shall conform to the following requirements:

- A. High strength threaded steel rods shall conform to the provisions for bars in Section 50-1.05, "Prestressing Steel," except Type II bars shall be used.
- B. High strength steel plates shall conform to the requirements in ASTM Designation: A 709/A 709M, Grade 345.
- C. Anchor nuts shall conform to the provisions in the second paragraph in Section 50-1.06, "Anchorages and Distribution."

The Contractor may use additional cementitious material in the concrete for the load test and anchor piles.

**In Section 49-1.05 replace the 1st paragraph with:**

Driven piles shall be installed with impact hammers that are approved in writing by the Engineer. Impact hammers shall be steam, hydraulic, air or diesel hammers. Impact hammers shall develop sufficient energy to drive the piles at a penetration rate of not less than 3 mm per blow at the specified nominal resistance.

**In Section 49-1.05 replace the 7th paragraph with:**

When necessary to obtain the specified penetration and when authorized by the Engineer, the Contractor may supply and operate one or more water jets and pumps, or furnish the necessary drilling apparatus and drill holes not greater than the least dimension of the pile to the proper depth and drive the piles therein. Jets shall not be used at locations where the stability of embankments or other improvements would be endangered. In addition, for steel piles, steel shells, or steel casings, when necessary to obtain the specified penetration or to prevent damage to the pile during installation, the Contractor shall provide special driving tips or heavier pile sections or take other measures as approved by the Engineer.

The use of followers or underwater hammers for driving piles will be permitted if authorized in writing by the Engineer. When a follower or underwater hammer is used, its efficiency shall be verified by furnishing the first pile in each bent or footing sufficiently long and driving the pile without the use of a follower or underwater hammer.

**In Section 49-1.07 replace the 2nd paragraph with:**

Timber piles shall be fresh-headed and square and when permitted by the Engineer, the heads of the piles may be protected by means of heavy steel or wrought iron rings. During driving operations timber piling shall be restrained from lateral movement at intervals not to exceed 6 m over the length between the driving head and the ground surface. During driving operations, the timber pile shall be kept moving by continuous operation of the hammer. When the blow count exceeds either 2 times the blow count required in 300 mm, or 3 times the blow count required in 75 mm for the nominal resistance as shown on the plans, computed in conformance with the provisions in Section 49-1.08, "Pile Driving Acceptance Criteria," additional aids shall be used to obtain the specified penetration. These aids may include the use of water jets or drilling, where permitted, or the use of a larger hammer employing a heavy ram striking with a low velocity.

**Replace Section 49-1.08 with:**

**49-1.08 PILE DRIVING ACCEPTANCE CRITERIA**

Except for piles to be load tested, driven piles shall be driven to a value of not less than the nominal resistance shown on the plans unless otherwise specified in the special provisions or permitted in writing by the Engineer. In addition, when a pile tip elevation is specified, driven piles shall penetrate at least to the specified tip elevation, unless otherwise permitted in writing by the Engineer. Piles to be load tested shall be driven to the specified tip elevation.

When the pile nominal resistance is omitted from the plans or the special provisions, timber piles shall be driven to a nominal resistance of 800 kN, and steel and concrete piles shall be driven to a nominal resistance of 1250 kN.

The nominal resistance for driven piles shall be determined from the following formula in which " $R_u$ " is the nominal resistance in kilonewtons, " $E_r$ " is the manufacturer's rating for joules of energy developed by the hammer at the observed field drop height, and " $N$ " is the number of hammer blows in the last 300 millimeters. (maximum value to be used for  $N$  is 100):

$$R_u = (7 * (E_r)^{1/2} * \log_{10} (0.83 * N)) - 550$$

**In Section 49-2.03 replace the 1st paragraph with:**

When preservative treatment of timber piles is required by the plans or specified in the special provisions, the treatment shall conform to the provisions in Section 58, "Preservative Treatment of Lumber, Timber and Piling," and the applicable AWP A Use Category.

**In Section 49-2.04 replace the 1st paragraph with:**

- A. An application of wood preservative conforming to the provisions in Section 58-1.04, "Wood Preservative for Manual Treatment," shall first be applied to the head of the pile and a protective cap shall then be built

up by applying alternate layers of loosely woven fabric and hot asphalt or tar similar to membrane waterproofing, using 3 layers of asphalt or tar and 2 layers of fabric. The fabric shall measure at least 150 mm more in each direction than the diameter of the pile and shall be turned down over the pile and the edges secured by binding with 2 turns of No. 10 galvanized wire. The fabric shall be wired in advance of the application of the final layer of asphalt or tar, which shall extend down over the wiring.

- B. The sawed surface shall be covered with 3 applications of a hot mixture of 60 percent creosote and 40 percent roofing pitch, or thoroughly brushcoated with 3 applications of hot creosote and covered with hot roofing pitch. A covering of 3.50-mm nominal thickness galvanized steel sheet shall be placed over the coating and bent down over the sides of each pile to shed water.

**In Section 49-3.01 the 5th paragraph is deleted**

**In Section 49-3.01 replace the 6th and 7th paragraphs with:**

Except for precast prestressed concrete piles in a corrosive environment, lifting anchors used in precast prestressed concrete piles shall be removed, and the holes filled in conformance with the provisions in Section 51-1.18A, "Ordinary Surface Finish."

Lifting anchors used in precast prestressed concrete piles in a corrosive environment shall be removed to a depth of at least 25 mm below the surface of the concrete, and the resulting hole shall be filled with epoxy adhesive before the piles are delivered to the job site. The epoxy adhesive shall conform to the provisions in Sections 95-1, "General," and 95-2.01, "Binder (Adhesive), Epoxy Resin Base (State Specification 8040-03)."

**In Section 49-4.01 replace the 1st and 2nd paragraphs with:**

Cast-in-place concrete piles shall consist of one of the following:

- A. Steel shells driven permanently to the required nominal resistance and penetration and filled with concrete.
- B. Steel casings installed permanently to the required penetration and filled with concrete.
- C. Drilled holes filled with concrete.
- D. Rock sockets filled with concrete.

The drilling of holes shall conform to the provisions in these specifications. Concrete filling for cast-in-place concrete piles is designated by compressive strength and shall have a minimum 28-day compressive strength of 25 MPa. At the option of the Contractor, the combined aggregate grading for the concrete shall be either the 25-mm maximum grading, the 12.5-mm maximum grading, or the 9.5-mm maximum grading. Concrete shall conform to the provisions in Section 90, "Portland Cement Concrete," and Section 51, "Concrete Structures." Reinforcement shall conform to the provisions in Section 52, "Reinforcement."

**In Section 49-4.03 replace the 4th paragraph with:**

After placing reinforcement and prior to placing concrete in the drilled hole, if caving occurs or deteriorated foundation material accumulates on the bottom of the hole, the bottom of the drilled hole shall be cleaned. The Contractor shall verify that the bottom of the drilled hole is clean.

**In Section 49-4.04 replace the 1st and 2nd paragraphs with:**

Steel shells shall be sufficiently watertight to exclude water during the placing of concrete. The shells may be cylindrical or tapered, step-tapered, or a combination of either, with cylindrical sections.

**In Section 49-4.05 replace the 1st paragraph with:**

After being driven and prior to placing reinforcement and concrete therein, the steel shells shall be examined for collapse or reduced diameter at any point. Any shell which is improperly driven or broken or shows partial collapse to such an extent as to materially decrease its nominal resistance will be rejected. Rejected shells shall be removed and replaced, or a new shell shall be driven adjacent to the rejected shell. Rejected shells which cannot be removed shall be filled with concrete by the Contractor at the Contractor's expense. When a new shell is driven to replace a

rejected shell, the Contractor, at the Contractor's expense, shall enlarge the footing as determined necessary by the Engineer.

**In Section 49-4.05 replace the 3rd paragraph with:**

Steel pipe piles shall conform to the following requirements:

1. Steel pipe piles less than 360 mm in diameter shall conform to the requirements in ASTM Designation: A 252, Grade 2 or 3.
2. Steel pipe piles 360 mm and greater in diameter shall conform to the requirements in ASTM Designation: A 252, Grade 3.
3. Steel pipe piles shall be of the nominal diameter and nominal wall thickness shown on the plans or specified in the special provisions.
4. The carbon equivalency (CE) of steel for steel pipe piles, as defined in AWS D 1.1, Section XI5.1, shall not exceed 0.45.
5. The sulfur content of steel for steel pipe piles shall not exceed 0.05-percent.
6. Seams in steel pipe piles shall be complete penetration welds.

**In Section 49-6.01 replace the 1st paragraph with:**

The length of timber, steel, and precast prestressed concrete piles, and of cast-in-place concrete piles consisting of driven shells filled with concrete, shall be measured along the longest side, from the tip elevation shown on the plans to the plane of pile cut-off.

**In Section 49-6.02 replace the 3rd paragraph with:**

The contract price paid per meter for cast-in-drilled-hole concrete piling shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all work involved in drilling holes, disposing of material resulting from drilling holes, temporarily casing holes and removing water when necessary, furnishing and placing concrete and reinforcement, and constructing reinforced concrete extensions, complete in place, to the required penetration, as shown on the plans, as specified in these specifications and in the special provisions, and as directed by the Engineer.

**In Section 49-6.02 replace the 7th paragraph with:**

The contract unit price paid for drive pile shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in driving timber, concrete and steel piles, driving steel shells for cast-in-place concrete piles, placing filling materials for cast-in-place concrete piles and cutting off piles, all complete in place to the required nominal resistance and penetration as shown on the plans and as specified in these specifications and the special provisions, and as directed by the Engineer.

**In Section 49-6.02 replace the 9th paragraph with:**

Full compensation for all jetting, drilling, providing special driving tips or heavier sections for steel piles or shells, or other work necessary to obtain the specified penetration and nominal resistance of the piles, for predrilling holes through embankment and filling the space remaining around the pile with sand or pea gravel, for disposing of material resulting from jetting, drilling or predrilling holes, and for all excavation and backfill involved in constructing concrete extensions as shown on the plans, and as specified in these specifications and the special provisions, and as directed by the Engineer shall be considered as included in the contract unit price paid for drive pile or in the contract price paid per meter for cast-in-drilled-hole concrete piling, and no additional compensation will be allowed therefor.

**In Section 49-6.02, add:**

Full compensation for furnishing and placing additional testing reinforcement, for load test anchorages, and for cutting off test piles, shall be considered as included in the contract price paid for piling of the type or class shown in the Engineer's Estimate, and no additional compensation will be allowed.

No additional compensation or extension of time will be made for additional foundation investigation, installation and testing of indicator piling, cutting off piling and restoring the foundation investigation and indicator pile sites, and review of request by the Engineer.

All remedial work required to achieve the required nominal resistance, including suspending driving operations above the required tip elevation and redriving piles at a later time, when directed by the Engineer, will be paid for as extra work as provided in Section 4-1.03D, "Extra Work."

## SECTION 50 PRESTRESSING CONCRETE

(Issued 04-04-08)

Each working drawing submittal shall consist of plans for a single bridge or portion thereof. For multi-frame bridges, each frame shall require a separate working drawing submittal.

Contract No. 04-0120T4  
134 of 220

When bars are to be extended by the use of couplers, the assembled units shall have a tensile strength of not less than the manufacturer's minimum guaranteed ultimate tensile strength of the bars. Failure of any one sample to meet this requirement will be cause for rejection of the heat of bars and lot of couplers. The location of couplers in the member shall be subject to approval by the Engineer.

Wires shall be straightened if necessary to produce equal stress in all wires or wire groups or parallel lay cables that are to be stressed simultaneously or when necessary to ensure proper positioning in the ducts.

Where wires are to be button-headed, the buttons shall be cold formed symmetrically about the axes of the wires. The buttons shall develop the minimum guaranteed ultimate tensile strength of the wire. No cold forming process shall be used that causes indentations in the wire. Buttonheads shall not contain wide open splits, more than 2 splits per head, or splits not parallel with the axis of the wire.

Prestressing steel shall be protected against physical damage and rust or other results of corrosion at all times from manufacture to grouting or encasing in concrete. Prestressing steel that has sustained physical damage at any time shall be rejected. The development of visible rust or other results of corrosion shall be cause for rejection, when ordered by the Engineer.

Epoxy-coated prestressing steel strand shall be covered with an opaque polyethylene sheeting or other suitable protective material to protect the strand from exposure to sunlight, salt spray, and weather. For stacked coils, the protective covering shall be draped around the perimeter of the stack. The covering shall be adequately secured; however, it should allow for air circulation around the strand to prevent condensation under the covering. Epoxy-coated strand shall not be stored within 300 m of ocean or tidal water for more than 2 months.

Prestressing steel shall be packaged in containers or shipping forms for the protection of the steel against physical damage and corrosion during shipping and storage. Except for epoxy-coated strand, a corrosion inhibitor which prevents rust or other results of corrosion, shall be placed in the package or form, or shall be incorporated in a corrosion inhibitor carrier type packaging material, or when permitted by the Engineer, may be applied directly to the steel. The corrosion inhibitor shall have no deleterious effect on the steel or concrete or bond strength of steel to concrete. Packaging or forms damaged from any cause shall be immediately replaced or restored to original condition.

The shipping package or form shall be clearly marked with a statement that the package contains high-strength prestressing steel, and the type of corrosion inhibitor used, including the date packaged.

Prestressing steel for post-tensioning which is installed in members prior to placing and curing of the concrete, and which is not epoxy-coated, shall be continuously protected against rust or other results of corrosion, until grouted, by means of a corrosion inhibitor placed in the ducts or applied to the steel in the duct. The corrosion inhibitor shall conform to the provisions specified herein.

When steam curing is used, prestressing steel for post-tensioning shall not be installed until the steam curing is completed.

Water used for flushing ducts shall contain either quick lime (calcium oxide) or slaked lime (calcium hydroxide) in the amount of 0.01-kg/L. Compressed air used to blow out ducts shall be oil free.

When prestressing steel for post-tensioning is installed in the ducts after completion of concrete curing, and if stressing and grouting are completed within 10 days after the installation of the prestressing steel, rust which may form during those 10 days will not be cause for rejection of the steel. Prestressing steel installed, tensioned, and grouted in this manner, all within 10 days, will not require the use of a corrosion inhibitor in the duct following installation of the prestressing steel. Prestressing steel installed as above but not grouted within 10 days shall be subject to all the requirements in this section pertaining to corrosion protection and rejection because of rust. The requirements in this section pertaining to tensioning and grouting within 10 days shall not apply to epoxy-coated prestressing steel strand.

Any time prestressing steel for pretensioning is placed in the stressing bed and is exposed to the elements for more than 36 hours prior to encasement in concrete, adequate measures shall be taken by the Contractor, as approved by the Engineer, to protect the steel from contamination or corrosion.

After final fabrication of the seven-wire prestressing steel strand, no electric welding of any form shall be performed on the prestressing steel. Whenever electric welding is performed on or near members containing prestressing steel, the welding ground shall be attached directly to the steel being welded.

Pretensioned prestressing steel shall be cut off flush with the end of the member. For epoxy-coated prestressing steel, only abrasive saws shall be used to cut the steel. The exposed ends of the prestressing steel and a 25-mm strip of adjoining concrete shall be cleaned and painted. Cleaning shall be by wire brushing or abrasive blast cleaning to remove all dirt and residue on the metal or concrete surfaces. Immediately after cleaning, the surfaces shall be covered with one application of unthinned zinc-rich primer (organic vehicle type) conforming to the provisions in Section 91, "Paint," except that 2 applications shall be applied to surfaces which will not be covered by concrete or mortar. Aerosol cans shall not be used. The paint shall be thoroughly mixed at the time of application and shall be worked into any voids in the prestressing tendons.

**In Section 50-1.07 replace the 2nd paragraph with:**

Ducts shall be fabricated with either welded or interlocked seams. Galvanizing of the welded seam will not be required. Ducts shall have sufficient strength to maintain their correct alignment during placing of concrete. Joints between sections of duct shall be positive metallic connections which do not result in angle changes at the joints. Waterproof tape shall be used at the connections. Ducts shall be bent without crimping or flattening. Transition couplings connecting the ducts to anchoring devices shall be either ferrous metal or polyolefin. Ferrous metal transition couplings need not be galvanized.

**In Section 50-1.07 replace the 7th paragraph with:**

All ducts with a total length of 120 m or more shall be vented. Vents shall be placed at intervals of not more than 120 m and shall be located within 2 m of every high point in the duct profile. Vents shall be 12 mm minimum diameter standard pipe or suitable plastic pipe. Connections to ducts shall be made with metallic or plastic structural fasteners. Plastic components, if selected, shall not react with the concrete or enhance corrosion of the prestressing steel and shall be free of water soluble chlorides. The vents shall be mortar tight, taped as necessary, and shall provide means for injection of grout through the vents and for sealing the vents. Ends of vents shall be removed 25 mm below the roadway surface after grouting has been completed.

**In Section 50-1.08 replace the 6th paragraph with:**

The following formula and friction coefficients shall be used in calculating friction losses in tendons:

$$T_o = T_x e^{(\mu\alpha + KL)}$$

Where:

$T_o$  = steel stress at jacking end

$T_x$  = steel stress at any point x

e = base of Napierian logarithms

$\mu$  = friction curvature coefficient

$\alpha$  = total angular change of prestressing steel profile in radians from jacking end to point x

K = friction wobble coefficient (=0.00066/m)

L = length of prestressing steel from jacking end to point x

Type of Steel Tendon	Length of Tendon L(m)	Type of Duct	$\mu$
Wire or Strand	0 to less than 183	Rigid or semi-rigid galvanized sheet metal	0.15
	183 to less than 275		0.20
	275 to less than 366		0.25
	Greater than or equal to 366		0.25*
Wire or Strand	All	Plastic	0.23
	All	Rigid Steel Pipes	0.25*
High Strength Bar	All	Rigid or semi-rigid galvanized sheet metal	0.30

\* With the use of lubrication

**In Section 50-1.08 in the 11th paragraph, replace item 2 with:**

2. When the concrete is designated by class or cementitious material content, either the concrete compressive strength shall have reached the strength shown on the plans at the time of stressing or at least 28 days shall have elapsed since the last concrete to be prestressed has been placed, whichever occurs first.



Prestressing steel in pretensioned members shall not be cut or released until the concrete in the member has attained a compressive strength of not less than the value shown on the plans or 28 MPa, whichever is greater. In addition to these concrete strength requirements, when epoxy-coated prestressing steel strand is used, the steel shall not be cut or released until the temperature of the concrete surrounding the strand is less than 65°C, and falling.

**In Section 50-1.09 replace the 2nd and 3rd paragraphs with:**

- A. For wire or bars, one 2-m long sample and for strand, one 1.5-m long sample, of each size shall be furnished for each heat or reel.
- B. For epoxy-coated strand, one 1.5-m long sample of uncoated strand of each size shall be furnished for each reel.
- C. If the prestressing tendon is a bar, one 2-m long sample shall be furnished and in addition, if couplers are to be used with the bar, two 1.25-m long samples of bar, equipped with one coupler and fabricated to fit the coupler, shall be furnished.

surfaces shall be placed with the long dimension horizontal and with horizontal joints level and continuous. Form panels for curved surfaces of columns shall be continuous for a minimum of one quarter of the circumference, or 1.8 m. For walls with sloping footings which do not abut other walls, panels may be placed with the long dimension parallel to the footing. Form panels on each side of the panel joint shall be precisely aligned, by means of supports or fasteners common to both panels, to result in a continuous unbroken concrete plane surface. When prefabricated soffit panels are used, form filler panels joining prefabricated panels shall have a uniform minimum width of 0.3-m and shall produce a smooth uniform surface with consistent longitudinal joint lines between the prefabricated panels.

**In Section 51-1.06A replace the 1st paragraph with:**

The Contractor shall submit to the Engineer working drawings and design calculations for falsework proposed for use at bridges. For bridges where the height of any portion of the falsework, as measured from the ground line to the soffit of the superstructure, exceeds 4.25 m; or where any individual falsework clear span length exceeds 4.85 m; or where provision for vehicular, pedestrian, or railroad traffic through the falsework is made; the drawings shall be signed by an engineer who is registered as a Civil Engineer in the State of California. Six sets of the working drawings and 2 copies of the design calculations shall be furnished. Additional working drawings and design calculations shall be submitted to the Engineer when specified in "Railroad Relations and Insurance" of the special provisions.

**In Section 51-1.06A replace the 2nd paragraph with:**

The falsework drawings shall include details of the falsework erection and removal operations showing the methods and sequences of erection and removal and the equipment to be used. The details of the falsework erection and removal operations shall demonstrate the stability of all or any portions of the falsework during all stages of the erection and removal operations.

**In Section 51-1.06A replace the 7th paragraph with:**

In the event that several falsework plans are submitted simultaneously, or an additional plan is submitted for review before the review of a previously submitted plan has been completed, the Contractor shall designate the sequence in which the plans are to be reviewed. In such event, the time to be provided for the review of any plan in the sequence shall be not less than the review time specified above for that plan, plus 2 weeks for each plan of higher priority which is still under review. A falsework plan submittal shall consist of plans for a single bridge or portion thereof. For multi-frame bridges, each frame shall require a separate falsework plan submittal.

**In Section 51-1.06A, add:**

If structural composite lumber is proposed for use, the falsework drawings shall clearly identify the structural composite lumber members by grade (E value), species, and type. The Contractor shall provide technical data from the manufacturer showing the tabulated working stress values of the composite lumber. The Contractor shall furnish a certificate of compliance as specified in Section 6-1.07, "Certificates of Compliance," for each delivery of structural composite lumber to the project site.

For falsework piles with a calculated loading capacity greater than 900 kN, the falsework piles shall be designed by an engineer who is registered as either a Civil Engineer or a Geotechnical Engineer in the State of California, and the calculations shall be submitted to the Engineer.

**In Section 51-1.06A(1) replace the 1st paragraph with:**

The design load for falsework shall consist of the sum of dead and live vertical loads, and an assumed horizontal load. The minimum total design load for any falsework, including members that support walkways, shall be not less than 4800 N/m<sup>2</sup> for the combined live and dead load regardless of slab thickness.

**In Section 51-1.06A(1) replace the 8th paragraph with:**

In addition to the minimum requirements specified in this Section 51-1.06A, falsework for box girder structures with internal falsework bracing systems using flexible members capable of withstanding tensile forces only, shall be designed to include the vertical effects caused by the elongation of the flexible member and the design horizontal load combined with the dead and live loads imposed by concrete placement for the girder stems and connected bottom slabs. Falsework comprised of individual steel towers with bracing systems using flexible members capable of withstanding tensile forces only to resist overturning, shall be exempt from these additional requirements.

**In Section 51-1.06B replace the 3rd paragraph with:**

When falsework is supported on piles, the piles shall be driven and the actual nominal resistance assessed in conformance with the provisions in Section 49, "Piling."

**In Section 51-1.06B, add:**

For falsework piles with a calculated nominal resistance greater than 1800 kN, the Contractor shall conduct dynamic monitoring of pile driving and generate field acceptance criteria based on a wave equation analysis. These analyses shall be signed by an engineer who is registered as a Civil Engineer in the State of California and submitted to the Engineer prior to completion of falsework erection.

Prior to the placement of falsework members above the stringers, the final bracing system for the falsework shall be installed.

**In Section 51-1.06C, add:**

The falsework removal operation shall be conducted in such a manner that any portion of the falsework not yet removed remains in a stable condition at all times.

**In Section 51-1.09 replace the 6th paragraph with:**

Vibrators used to consolidate concrete containing epoxy-coated bar reinforcement or epoxy-coated prestressing steel shall have a resilient covering to prevent damage to the epoxy-coating on the reinforcement or prestressing steel.

**In Section 51-1.11 replace the 6th paragraph with:**

Construction methods and equipment employed by the Contractor shall conform to the provisions in Section 7-1.02, "Load Limitations."

**In Section 51-1.12D replace the 4th paragraph with:**

Expanded polystyrene shall be a commercially available polystyrene board. Expanded polystyrene shall have a minimum flexural strength of 240 kPa determined in conformance with the requirements in ASTM Designation: C 203 and a compressive yield strength of between 110 and 275 kPa at 5 percent compression. Surfaces of expanded polystyrene against which concrete is placed shall be faced with hardboard. Hardboard shall be 3 mm minimum thickness, conforming to ANSI A135.4, any class. Other facing materials may be used provided they furnish equivalent protection. Boards shall be held in place by nails, waterproof adhesive, or other means approved by the Engineer.

**In Section 51-1.12F, add:**

The opening of the joints at the time of placing shall be that shown on the plans adjusted for temperature. Care shall be taken to avoid impairment of the clearance in any manner.

**In Section 51-1.12F replace the 1st and 2nd paragraphs with:**

Where shown on the plans, joints in structures shall be sealed with joint seals, joint seal assemblies, or seismic joints in conformance with the details shown on the plans, the provisions in these specifications, and the special provisions.

Type A and AL joint seals shall consist of a groove in the concrete that is filled with field-mixed silicone sealant.

**In Section 51-1.12F replace the 4th and 5th paragraphs with:**

Joint seal assemblies and seismic joints shall consist of metal or metal and elastomeric assemblies which are anchored or cast into a recess in the concrete over the joint. Strip seal joint seal assemblies consist of only one joint cell. Modular unit joint seal assemblies consist of more than one joint cell.

The Movement Rating (MR) shall be measured normal to the longitudinal axis of the joint. The type of seal to be used for the MR shown on the plans shall be as follows:

Movement Rating (MR)	Seal Type
MR ≤ 25 mm	Type A or Type B
25 mm < MR ≤ 50 mm	Type B
50 mm < MR ≤ 100 mm	Joint Seal Assembly (Strip Seal)
MR > 100 mm	Joint Seal Assembly (Modular Unit) or Seismic Joint

**In Section 51-1.12F(3)(a) replace the 1st and 2nd paragraphs with:**

The sealant must consist of a 2-component silicone sealant that will withstand up to ±50 percent movement. Silicone sealants must be tested under California Test 435 and must comply with the following:

Specification	Requirement
Modulus at 150 percent elongation	35–520 kPa
Recovery	17 mm max.
Notch Test	Notched or loss of bond 6 mm, max.
Water Resistance	Notched or loss of bond 6 mm, max.
Ultraviolet Exposure ASTM Designation: G 154, Table X2.1, Cycle 2.	No more than slight checking or cracking.
Cone Penetration	4.5-12.0 mm

**In Section 51-1.12F(3)(a) delete the 3rd and 8th paragraphs.**

**In Section 51-1.12F(3)(a) replace the 10th paragraph with:**

A Certificate of Compliance accompanied by a certified test report must be furnished for each batch of silicone sealant in conformance with the provisions in Section 6-1.07, "Certificates of Compliance."

**In Section 51-1.12F(3)(b) replace the 2nd paragraph with:**

The preformed elastomeric joint seal must conform to the requirements in ASTM D 2628 and the following:

1. The seal must consist of a multichannel, nonporous, homogeneous material furnished in a finished extruded form.
2. The minimum depth of the seal measured at the contact surface must be at least 95 percent of the minimum uncompressed width of the seal as designated by the manufacturer.
3. When tested in conformance with the requirements in California Test 673 for Type B seals, joint seals must provide a movement rating (MR) of not less than that shown on the plans.
4. The top and bottom edges of the joint seal must maintain continuous contact with the sides of the groove over the entire range of joint movement.
5. The seal must be furnished full length for each joint with no more than 1 shop splice in any 18 m length of seal.
6. The Contractor must demonstrate the adequacy of the procedures to be used in the work before installing seals in the joints.
7. One field splice per joint may be made at locations and by methods approved by the Engineer. The seals are to be manufactured full length for the intended joint, then cut at the approved splice section and rematched before splicing. The Contractor must submit splicing details prepared by the joint seal manufacturer for approval before beginning splicing work.
8. Shop splices and field splices must have no visible offset of exterior surfaces and must show no evidence of bond failure.
9. At all open ends of the seal that would admit water or debris, each cell must be filled to a depth of 80 mm with commercial quality open cell polyurethane foam or closed by other means subject to approval by the Engineer.

**In Section 51-1.12F(3)(b) replace the 7th paragraph with:**

The joint seal must be installed full length for each joint with equipment that does not twist or distort the seal, elongate the seal longitudinally, or otherwise cause damage to the seal or to the concrete forming the groove.

**Replace Section 51-1.12F(3)(c), with:**

**(c) Joint Seal Assemblies and Seismic Joints**

Joint seal assemblies and seismic joints shall be furnished and installed in joints in bridge decks as shown on the plans and as specified in the special provisions.

**In Section 51-1.12H(1) replace the 8th paragraph with:**

The elastomer, as determined from test specimens, shall conform to the following:

Test	ASTM Designation	Requirement
Tensile strength, MPa	D 412	15.5 Min.
Elongation at break, percent	D 412	350 Min.
Compression set, 22 h at 70°C, percent	D 395 (Method B)	25 Max.
Tear strength, kN/m	D 624 (Die C)	31.5 Min.
Hardness (Type A)	D 2240 with 2 kg. mass	55 ±5
Ozone resistance 20% strain, 100 h at 40°C ±2°C	D 1149 (except 100 ±20 parts per 100 000 000)	No cracks
Instantaneous thermal stiffening at -40°C	D 1043	Shall not exceed 4 times the stiffness measured at 23°C
Low temperature brittleness at -40°C	D 746 (Procedure B)	Pass

**In Section 51-1.12H(1) in the 9th paragraph replace the table, with:**

Tensile strength, percent	-15
Elongation at break, percent	-40; but not less than 300% total elongation of the material
Hardness, points	+10

**In Section 51-1.12H(2) replace the 1st paragraph with:**

Steel reinforced elastomeric bearings shall conform to the requirements for steel-laminated elastomeric bearings in ASTM Designation: D 4014 and the following:

- A. The bearings shall consist of alternating steel laminates and internal elastomer laminates with top and bottom elastomer covers. Steel laminates shall have a nominal thickness of 1.9 mm (14 gage). Internal elastomer laminates shall have a thickness of 12 mm, and top and bottom elastomer covers shall each have a thickness of 6 mm. The combined thickness of internal elastomer laminates and top and bottom elastomer covers shall be equal to the bearing pad thickness shown on the plans. The elastomer cover to the steel laminates at the sides of the bearing shall be 3 mm. If guide pins or other devices are used to control the side cover over the steel laminates, any exposed portions of the steel laminates shall be sealed by vulcanized patching. The length, width, or diameter of the bearings shall be as shown on the plans.
- B. The total thickness of the bearings shall be equal to the thickness of elastomer laminates and covers plus the thickness of the steel laminates.
- C. Elastomer for steel reinforced elastomeric bearings shall conform to the provisions for elastomer in Section 51-1.12H(1), "Plain and Fabric Reinforced Elastomeric Bearing Pads."
- D. A Certificate of Compliance conforming to the provisions in Section 6-1.07, "Certificates of Compliance," shall be furnished to the Engineer certifying that the bearings to be furnished conform to all of the above provisions. The Certificate of Compliance shall be supported by a certified copy of the results of tests performed by the manufacturer on the bearings.

- E. One sample bearing shall be furnished to the Engineer from each lot of bearings to be furnished for the contract. Samples shall be available at least 3 weeks in advance of intended use. The sample bearing shall be one of the following:

Bearing Pad Thickness as Shown on the Plans	Sample Bearing
≤ 50 mm	Smallest complete bearing shown on the plans
> 50 mm	* 57 ± 3 mm thick sample not less than 200 mm x 305 mm in plan and cut by the manufacturer from the center of one of the thickest complete bearings

\* The sample bearing plus remnant parts of the complete bearing shall be furnished to the Engineer.

- F. A test specimen taken from the sample furnished to the Engineer will be tested in conformance with the requirements in California Test 663. Specimens tested shall show no indication of loss of bond between the elastomer and steel laminates.

**In Section 51-1.135 replace the 1st paragraph with:**

Mortar shall be composed of cementitious material, sand, and water proportioned and mixed as specified in this Section 51-1.135.

**In Section 51-1.135 replace the 3rd paragraph with:**

The proportion of cementitious material to sand, measured by volume, shall be 1:2 unless otherwise specified.

**In Section 51-1.14 replace the 4th paragraph with:**

Neoprene shall be manufactured from a vulcanized elastomeric compound containing neoprene as the sole elastomer and shall conform to the following:

Test	ASTM Designation	Requirement
Tensile strength, MPa	D 412	13.8 Min.
Elongation at break, percent	D 412	300 Min.
Compression set, 22 h at 70°C, percent	D 395 (Method B)	30 Max.
Tear strength, kN/m	D 624 (Die C)	26.3 Min.
Hardness (Type A)	D 2240	55±5
Ozone resistance 20% strain, 100 h at 38°C ±1°C	D 1149 (except 100±20 parts per 100 000 000)	No cracks
Low temperature brittleness at -40°C	D 746 (Procedure B)	Pass
Flame resistance	C 542	Must not propagate flame
Oil Swell, ASTM Oil #3, 70 h at 100°C, volume change, percent	D 471	80 Max.
Water absorption, immersed 7 days at 70°C, change in mass, percent	D 471	15 Max.

**In Section 51-1.17 in 4th paragraph, replace the 1st sentence with:**

The smoothness of completed roadway surfaces of structures, approach slabs and the adjacent 15 m of approach pavement, and the top surfaces of concrete decks which are to be covered with another material, will be tested by the Engineer with a bridge profilograph in conformance with the requirements in California Test 547 and the requirements herein.

**In Section 51-1.17 delete the 7th paragraph**

**In Section 51-1.17 delete the 13th paragraph**

**In Section 51-1.17 delete the 14th paragraph**

**Add Section:**

**51-1.17A DECK CRACK TREATMENT**

The Contractor shall use all means necessary to minimize the development of shrinkage cracks.

The Contractor shall remove all equipment and materials from the deck and clean the surface as necessary for the Engineer to measure the surface crack intensity. Surface crack intensity will be determined by the Engineer after completion of concrete cure, before prestressing, and before the release of falsework. In any 50 square meter portion of deck within the limits of the new concrete deck, should the intensity of cracking be such that there are more than 5 m of cracks whose width at any location exceeds 0.5 mm, the deck shall be treated with methacrylate resin. The area of deck to be treated shall have a width that extends for the entire width of new deck inside the concrete barriers and a length that extends at least 1.5 m beyond the furthest single continuous crack outside the 50 square meter portion, measured from where that crack exceeds 0.5 mm in width, as determined by the Engineer.

Deck crack treatment shall include furnishing, testing, and application of methacrylate resin and sand. If grinding is required, deck treatment shall take place before grinding.

**51-1.17A(1) Submittals**

Before starting deck treatment, the Contractor shall submit plans in conformance with Section 5-1.02, "Plans and Working Drawings," for the following:

1. Public safety plan for the use of methacrylate resin
2. Placement plan for the construction operation

The plans shall identify materials, equipment, and methods to be used.

The public safety plan for the use of methacrylate resin shall include details for the following:

1. Shipping
2. Storage
3. Handling
4. Disposal of residual methacrylate resin and the containers

The placement plan for construction shall include the following:

1. Schedule of deck treatment for each bridge. The schedule shall be consistent with "Maintaining Traffic," of the special provisions and shall include time for the Engineer to perform California Test 342.
2. Methods and materials to be used, including the following:
  - 2.1. Description of equipment for applying the resin
  - 2.2. Description of equipment for applying the sand
  - 2.3. Gel time range and final cure time for the resin

If the measures proposed in the safety plan are inadequate to provide for public safety associated with the use of methacrylate resin, the Engineer will reject the plan and direct the Contractor to revise the plan. Directions for revisions will be in writing and include detailed comments. The Engineer will notify the Contractor of the approval or rejection of a submitted or revised plan within 15 days of receipt of that plan.

In the event the Engineer fails to complete the review within the time allowed, and if, in the opinion of the Engineer, completion of the work is delayed or interfered with by reason of the Engineer's delay in completing the review, the Contractor will be compensated for any resulting loss, and an extension of time will be granted, in the same manner as provided for in Section 8-1.09, "Right of Way Delays."

### 51-1.17A(2) Materials

Before using methacrylate resin, a Material Safety Data Sheet shall be submitted for each shipment of resin.

Methacrylate resin shall be low odor and have a high molecular weight. Before adding initiator, the resin shall have a maximum volatile content of 30 percent when tested in conformance with the requirements in ASTM Designation: D 2369, and shall conform to the following:

PROPERTY	REQUIREMENT	TEST METHOD
* Viscosity	0.025 Pa·s, maximum, (Brookfield RVT with UL adaptor, 50 RPM at 25°C	ASTM D 2196
* Specific Gravity	0.90 minimum, at 25°C	ASTM D 1475
* Flash Point	82°C, minimum	ASTM D 3278
* Vapor Pressure	1.0 mm Hg, maximum, at 25°C	ASTM D 323
Tack-free Time	400 minutes, maximum, at 25°C	Specimen prepared per California Test 551
PCC Saturated Surface-Dry Bond Strength	3.5 MPa, minimum at 24 hours and 21±1°C	California Test 551
* Test shall be performed before adding initiator.		

### 51-1.17A(3) Testing

The Contractor shall allow 20 days for sampling and testing by the Engineer of the methacrylate resin before proposed use. If bulk resin is to be used, the Contractor shall notify the Engineer in writing at least 15 days before the delivery of the bulk resin to the job site. Bulk resin is any resin stored in containers in excess of 209 liters.

Before starting production treatment, the Contractor shall treat a test area of approximately 50 square meters that is within the project limits and at a location approved by the Engineer. When available the test area shall be outside of the traveled way. Weather and pavement conditions during the test treatment shall be similar to those expected on the deck. Equipment used for testing shall be similar to those used for deck treating operations.

During test and production deck treatment, test tiles shall be used to evaluate the resin cure time. The Contractor shall coat at least one 102 mm x 102 mm commercial quality smooth glazed tile for each batch of methacrylate resin. The coated tile shall be placed adjacent to the corresponding treated area. Sand shall not be applied to the test tiles.

The acceptance criteria for a treated area is as follows:

1. The test tiles are dry to the touch.
2. The treated deck surface is tack free (non-oily).
3. The sand cover adheres and resists brushing by hand.
4. Excess sand has been removed by vacuuming or sweeping.
5. The coefficient of friction is at least 0.35 when tested in conformance with California Test 342.

If a test or production area fails to meet the acceptance criteria, as determined by the Engineer, the treatment will be rejected, and the treatment shall be removed and replaced until the area complies with the acceptance criteria.

### 51-1.17A(4) Construction

Equipment shall be fitted with suitable traps, filters, drip pans, or other devices as necessary to prevent oil or other deleterious material from being deposited on the deck.

Before deck treatment with methacrylate resin, the bridge deck surface shall be cleaned by abrasive blasting, and all loose material shall be blown from visible cracks using high-pressure air. Concrete curing seals shall be cleaned from the deck surface to be treated, and the deck shall be dry when blast cleaning is performed. If the deck



surface becomes contaminated at any time before placing the resin, the deck surface shall be cleaned by abrasive blasting.

Where abrasive blasting is being performed within 3 m of a lane occupied by public traffic, the residue including dust shall be removed immediately after contact between the abrasive and the surface being treated. The removal shall be by a vacuum attachment operating concurrently with the abrasive blasting operation.

A compatible promoter/initiator system shall be capable of providing the resin gel time range shown on the placement plan. Gel time shall be adjusted to compensate for the changes in temperature throughout treatment application.

Resin shall be applied by machine and by using a two-part resin system with a promoted resin for one part and an initiated resin for the other part. This two-part resin system shall be combined at equal volumes to the spray bars through separate positive displacement pumps. Combining of the 2 components shall be by either static in-line mixers or by external intersecting spray fans. The pump pressure at the spray bars shall not be great enough to cause appreciable atomization of the resin. Compressed air shall not be used to produce the spray. A shroud shall be used to enclose the spray bar apparatus.

At the Contractor's option, manual application may be used. For manual application, (1) the quantity of resin mixed with promoter and initiator shall be limited to 20 L at a time, and (2) the resin shall be distributed by squeegees and brooms within 10 minutes after application.

The Contractor shall apply methacrylate resin only to the specified area. Barriers, railing, joints, and drainage facilities shall be adequately protected to prevent contamination by the treatment material. Contaminated items shall be repaired at the Contractor's expense.

The relative humidity shall be less than 90 percent at the time of treatment. The prepared area shall be dry and the surface temperature shall be at least 10°C, and not more than 38°C when the resin is applied. The rate of application of promoted/initiated resin shall be 2.2 square meter per liter; the exact rate shall be determined by the Engineer.

The deck surfaces to be treated shall be completely covered with resin so the resin penetrates and fills all cracks. The resin shall be applied within 5 minutes after complete mixing. A significant increase in viscosity shall be cause for rejection. Excess material shall be redistributed by squeegees or brooms within 10 minutes after application. For textured deck surfaces, including grooved surfaces, excess material shall be removed from the texture indentations.

After the resin has been applied, at least 20 minutes shall elapse before applying sand. The sand shall be commercial quality dry blast sand. At least 95 percent of the sand shall pass the 2.36-mm sieve and at least 95 percent shall be retained on the 850-µm sieve. The sand shall be applied at a rate of approximately one kilogram per square meter or until refusal as determined by the Engineer.

Traffic will not be allowed on treated areas until the acceptance criteria has been met as determined by the Engineer.

**In Section 51-1.18C replace the 2nd paragraph with:**

When Class 2 surface finish (gun finish) is specified, ordinary surface finish shall first be completed. The concrete surfaces shall then be abrasive blasted to a rough texture and thoroughly washed down with water. While the washed surfaces are damp, but not wet, a finish coating of machine applied mortar, approximately 6 mm thick, shall be applied in not less than 2 passes. The coating shall be pneumatically applied and shall consist of either (1) sand, cementitious material, and water mechanically mixed prior to its introduction to the nozzle or (2) premixed sand and cementitious material to which water is added prior to its expulsion from the nozzle. The use of admixtures shall be subject to the approval of the Engineer as provided in Section 90, "Portland Cement Concrete." Unless otherwise specified, supplementary cementitious materials will not be required. The proportion of cementitious material to sand shall be not less than one to 4, unless otherwise directed by the Engineer. Sand shall be of a grading suitable for the purpose intended. The machines shall be operated and the coating shall be applied in conformance with standard practice. The coating shall be firmly bonded to the concrete surfaces on which it is applied.

**In Section 51-1.18C replace the 5th paragraph with:**

When surfaces to be finished are in pedestrian undercrossings, the sand shall be silica sand and the cementitious material shall be standard white portland cement.

Full compensation for drilling holes for dowels and grouting dowels in drilled holes; furnishing and placing mortar for mortaring spaces and recesses in and between precast members; furnishing and placing grit for walkways, stair treads and landings; furnishing and placing expansion joint filler, sheet packing, board fillers, elastomeric bearing pads, sliding joints, sliding bearings and preformed fabric pads; and grinding or grooving, as required, shall be considered as included in the contract prices paid for the various items of concrete work and no additional compensation will be allowed therefor.

Full compensation for deck crack treatment, including execution of the public safety plan, shall be considered as included in the contract price paid per cubic meter for structural concrete, bridge, and no additional compensation will be allowed therefor.

Contract No. 04-0120T4  
146 of 220

of any portion of the temporary support system, the working drawings shall show the support system to be used during each phase of construction. The minimum horizontal wind load to be applied to the bar reinforcing steel assemblage, or to a combined assemblage of reinforcing steel and forms, shall be the sum of the products of the wind impact area and the applicable wind pressure value for each height zone. The wind impact area is the total projected area of the cage normal to the direction of the applied wind. Wind pressure values shall be determined from the following table:

Height Zone (Meters above ground)	Wind Pressure Value (Pa)
0-9.0	960
9.1-15.0	1200
15.1-30.0	1440
Over 30	1675

**Replace Section 52-1.08 with:**

**52-1.08 SPLICING**

Splices of reinforcing bars shall consist of lap splices, service splices, or ultimate butt splices.

Splicing of reinforcing bars will not be permitted at a location designated on the plans as a "No-Splice Zone." At the option of the Contractor, reinforcing bars may be continuous at locations where splices are shown on the plans. The location of splices, except where shown on the plans, shall be determined by the Contractor using available commercial lengths where practicable.

Unless otherwise shown on the plans, splices in adjacent reinforcing bars at any particular section shall be staggered. The minimum distance between staggered lap splices or mechanical lap splices shall be the same as the length required for a lap splice in the largest bar. The minimum distance between staggered butt splices shall be 600 mm, measured between the midpoints of the splices along a line which is centered between the axes of the adjacent bars.

**52-1.08A Lap Splicing Requirements**

Splices made by lapping shall consist of placing reinforcing bars in contact and wiring them together, maintaining the alignment of the bars and the minimum clearances. Should the Contractor elect to use a butt welded or mechanical splice at a location not designated on the plans as requiring a service or ultimate butt splice, this splice shall conform to the testing requirements for service splice.

Reinforcing bars shall not be spliced by lapping at locations where the concrete section is not sufficient to provide a minimum clear distance of 50 mm between the splice and the nearest adjacent bar. The clearance to the surface of the concrete specified in Section 52-1.07, "Placing," shall not be reduced.

Reinforcing bars Nos. 43 and 57 shall not be spliced by lapping.

Where ASTM Designations: A 615/A 615M, Grade 420 or A 706/A 706M reinforcing bars are required, the length of lap splices shall be as follows: Reinforcing bars No. 25 or smaller shall be lapped at least 45 diameters of the smaller bar joined; and reinforcing bars Nos. 29, 32, and 36 shall be lapped at least 60 diameters of the smaller bar joined, except when otherwise shown on the plans.

Where ASTM Designation: A 615/A 615M, Grade 280 reinforcing bars are permitted, the length of lap splices shall be as follows: Reinforcing bars No. 25 or smaller shall be lapped at least 30 diameters of the smaller bar joined; and reinforcing bars Nos. 29, 32, and 36 shall be lapped at least 45 diameters of the smaller bar joined, except when otherwise shown on the plans.

Splices in bundled bars shall conform to the following:

- A. In bundles of 2 bars, the length of the lap splice shall be the same as the length of a single bar lap splice.
- B. In bundles of 3 bars, the length of the lap splice shall be 1.2 times the length of a single bar lap splice.

Welded wire fabric shall be lapped such that the overlap between the outermost cross wires is not less than the larger of:

- A. 150 mm,
- B. The spacing of the cross wires plus 50 mm, or
- C. The numerical value of the longitudinal wire size (MW-Size Number) times 370 divided by the spacing of the longitudinal wires in millimeters.

### **52-1.08B Service Splicing and Ultimate Butt Splicing Requirements**

Service splices and ultimate butt splices shall be either butt welded or mechanical splices, shall be used at the locations shown on the plans, and shall conform to the requirements of these specifications and the special provisions.

#### **52-1.08B(1) Mechanical Splices**

Mechanical splices to be used in the work shall be on the Department's current prequalified list before use. The prequalified list can be obtained from the Department's internet site listed in the special provisions or by contacting the Transportation Laboratory directly.

When tested in conformance with the requirements in California Test 670, the total slip shall not exceed the values listed in the following table:

Reinforcing Bar Number	Total Slip (μm)
13	250
16	250
19	250
22	350
25	350
29	350
32	450
36	450
43	600
57	750

Slip requirements shall not apply to mechanical lap splices, splices that are welded, or splices that are used on hoops.

Splicing procedures shall be in conformance with the manufacturer's recommendations, except as modified in this section. Splices shall be made using the manufacturer's standard equipment, jigs, clamps, and other required accessories.

Splice devices shall have a clear coverage of not less than 40 mm measured from the surface of the concrete to the outside of the splice device. Stirrups, ties, and other reinforcement shall be adjusted or relocated, and additional reinforcement shall be placed, if necessary, to provide the specified clear coverage to reinforcement.

The Contractor shall furnish the following information for each shipment of splice material in conformance with the provisions in Section 6-1.07, "Certificates of Compliance:"

- A. The type or series identification of the splice material including tracking information for traceability.
- B. The bar grade and size number to be spliced.
- C. A copy of the manufacturer's product literature giving complete data on the splice material and installation procedures.
- D. A statement that the splicing systems and materials used in conformance with the manufacturer's installation procedures will develop the required tensile strengths, based on the nominal bar area, and will conform to the total slip requirements and the other requirements in these specifications.
- E. A statement that the splice material conforms to the type of mechanical splice in the Department's current prequalified list.

#### **52-1.08B(2) Butt Welded Splices**

Except for resistance butt welds, butt welded splices of reinforcing bars shall be complete joint penetration butt welds conforming to the requirements in AWS D 1.4, and these specifications.

Welders and welding procedures shall be qualified in conformance with the requirements in AWS D 1.4.

Only the joint details and dimensions as shown in Figure 3.2, "Direct Butt Joints," of AWS D 1.4, shall be used for making complete joint penetration butt welds of bar reinforcement. Split pipe backing shall not be used.

Butt welds shall be made with multiple weld passes using a stringer bead without an appreciable weaving motion. The maximum stringer bead width shall be 2.5 times the diameter of the electrode and slagging shall be performed between each weld pass. Weld reinforcement shall not exceed 4 mm in convexity.

Electrodes used for welding shall meet the minimum Charpy V-notch impact requirement of 27°J at -20°C.

For welding of bars conforming to the requirements of ASTM Designation: A 615/A 615M, Grade 280 or Grade 420, the requirements of Table 5.2, "Minimum Preheat and Interpass Temperatures," of AWS D 1.4 are superseded by the following:

The minimum preheat and interpass temperatures shall be 200°C for Grade 280 bars and 300°C for Grade 420 bars. Immediately after completing the welding, at least 150 mm of the bar on each side of the splice shall be covered by an insulated wrapping to control the rate of cooling. The insulated wrapping shall remain in place until the bar has cooled below 90°C.

When welding different grades of reinforcing bars, the electrode shall conform to Grade 280 bar requirements and the preheat shall conform to the Grade 420 bar requirements.

In the event that any of the specified preheat, interpass, and post weld cooling temperatures are not met, all weld and heat affected zone metal shall be removed and the splice rewelded.

Welding shall be protected from air currents, drafts, and precipitation to prevent loss of heat or loss of arc shielding. The method of protecting the welding area from loss of heat or loss of arc shielding shall be subject to approval by the Engineer.

Reinforcing bars shall not be direct butt spliced by thermite welding.

Procedures to be used in making welded splices in reinforcing bars, and welders employed to make splices in reinforcing bars, shall be qualified by tests performed by the Contractor on sample splices of the type to be used, before making splices to be used in the work.

### **52-1.08B(3) Resistance Butt Welds**

Shop produced resistance butt welds shall be produced by a fabricator who is approved by the Transportation Laboratory. The list of approved fabricators can be obtained from the Department's internet site or by contacting the Transportation Laboratory directly.

Before manufacturing hoops using resistance butt welding, the Contractor shall submit to the Engineer the manufacturer's Quality Control (QC) manual for the fabrication of hoops. As a minimum, the QC manual shall include the following:

- A. The pre-production procedures for the qualification of material and equipment.
- B. The methods and frequencies for performing QC procedures during production.
- C. The calibration procedures and calibration frequency for all equipment.
- D. The welding procedure specification (WPS) for resistance welding.
- E. The method for identifying and tracking lots.

### **52-1.08C Service Splice and Ultimate Butt Splice Testing Requirements**

The Contractor shall designate in writing a splicing Quality Control Manager (QCM). The QCM shall be responsible directly to the Contractor for 1) the quality of all service and ultimate butt splicing including the inspection of materials and workmanship performed by the Contractor and all subcontractors; and 2) submitting, receiving, and approving all correspondence, required submittals, and reports regarding service and ultimate splicing to and from the Engineer.

The QCM shall not be employed or compensated by any subcontractor, or by other persons or entities hired by subcontractors, who will provide other services or materials for the project. The QCM may be an employee of the Contractor.

Testing on prequalification and production sample splices shall be performed at the Contractor's expense, at an independent qualified testing laboratory. The laboratory shall not be employed or compensated by any subcontractor, or by other persons or entities hired by subcontractors who will provide other services or materials for the project, and shall have the following:

- A. Proper facilities, including a calibrated tensile testing machine capable of breaking the largest size of reinforcing bar to be tested.
- B. A device for measuring the total slip of the reinforcing bars across the splice to the nearest 25  $\mu$ m, that, when placed parallel to the longitudinal axis of the bar is able to simultaneously measure movement across the splice at 2 locations 180 degrees apart.
- C. Operators who have received formal training for performing the testing requirements of ASTM Designation: A 370 and California Test 670.

- D. A record of annual calibration of testing equipment performed by an independent third party that has 1) standards that are traceable to the National Institute of Standards and Technology, and 2) a formal reporting procedure, including published test forms.

The Contractor shall provide samples for quality assurance testing in conformance with the provisions in these specifications and the special provisions.

Prequalification and production sample splices and testing shall conform to California Test 670 and these specifications.

The Contractor shall ensure that sample splices are properly secured and transported to the testing laboratory in such a manner that no alterations to the physical conditions occur during transportation. Sample splices shall be tested in the same condition as received. No modifications to the sample splices shall be made before testing.

Each set or sample splice, as defined herein, shall be identified as representing either a prequalification or production test sample splice.

For the purpose of production testing, a lot of either service splices or ultimate butt splices is defined as 1) 150, or fraction thereof, of the same type of mechanical splices used for each bar size and each bar deformation pattern that is used in the work, or 2) 150, or fraction thereof, of complete joint penetration butt welded splices or resistance butt welded splices for each bar size used in the work. If different diameters of hoop reinforcement are shown on the plans, separate lots shall be used for each different hoop diameter.

Whenever a lot of splices is rejected, the rejected lot and subsequent lots of splices shall not be used in the work until 1) the QCM performs a complete review of the Contractor's quality control process for these splices, 2) a written report is submitted to the Engineer describing the cause of failure for the splices in this lot and provisions for preventing similar failures in future lots, and 3) the Engineer has provided the Contractor with written notification that the report is acceptable. The Engineer shall have 3 working days after receipt of the report to provide notification to the Contractor. In the event the Engineer fails to provide notification within the time allowed, and if, in the opinion of the Engineer, completion of the work is delayed or interfered with by reason of the Engineer's delay in providing notification, the Contractor will be compensated for any resulting loss, and an extension of time will be granted in the same manner as provided for in Section 8-1.09, "Right of Way Delays."

#### **52-1.08C(1) Splice Prequalification Report**

Before using any service splices or ultimate butt splices in the work, the Contractor shall submit a Splice Prequalification Report. The report shall include splice material information, names of the operators who will be performing the splicing, and descriptions of the positions, locations, equipment, and procedures that will be used in the work.

The Splice Prequalification Report shall also include certifications from the fabricator for prequalifications of operators and procedures based on sample tests performed no more than 2 years before submitting the report. Each operator shall be certified by performing 2 sample splices for each bar size of each splice type that the operator will be performing in the work. For deformation-dependent types of splice devices, each operator shall be certified by performing 2 additional samples for each bar size and deformation pattern that will be used in the work.

Prequalification sample splices shall be tested by an independent qualified testing laboratory and shall conform to the appropriate production test criteria and slip requirements specified herein. When epoxy-coated reinforcement is required, resistance butt welded sample splices shall have the weld flash removed by the same procedure as will be used in the work, before coating and testing. The Splice Prequalification Report shall include the certified test results for all prequalification sample splices.

The QCM shall review and approve the Splice Prequalification Report before submitting it to the Engineer for approval. The Contractor shall allow 2 weeks for the review and approval of a complete report before performing any service splicing or ultimate butt splicing in the work. In the event the Engineer fails to complete the review within the time allowed, and in the opinion of the Engineer, completion of the work is delayed or interfered with by reason of the Engineer's delay in completing the review, the Contractor will be compensated for any resulting loss, and an extension of time will be granted, in the same manner as provided for in Section 8-1.09, "Right of Way Delays."

#### **52-1.08C(2) Service Splice Test Criteria**

Service production and quality assurance sample splices shall be tensile tested in conformance with the requirements in ASTM Designation: A 370 and California Test 670 and shall develop a minimum tensile strength of not less than 550 MPa.

### **52-1.08C(2)(a) Production Test Requirements for Service Splices**

Production tests shall be performed by the Contractor's independent laboratory for all service splices used in the work. A production test shall consist of testing 4 sample splices prepared for each lot of completed splices. The samples shall be prepared by the Contractor using the same splice material, position, operators, location, and equipment, and following the same procedure as used in the work.

At least one week before testing, the Contractor shall notify the Engineer in writing of the date when and the location where the testing of the samples will be performed.

The 4 samples from each production test shall be securely bundled together and identified with a completed sample identification card before shipment to the independent laboratory. The card will be furnished by the Engineer. Bundles of samples containing fewer than 4 samples of splices shall not be tested.

Before performing any tensile tests on production test sample splices, one of the 4 samples shall be tested for, and shall conform to, the requirements for total slip. Should this sample not meet the total slip requirements, one retest, in which the 3 remaining samples are tested for total slip, will be allowed. Should any of the 3 remaining samples not conform to the total slip requirements, all splices in the lot represented by this production test will be rejected.

If 3 or more sample splices from a production test conform to the provisions in this Section 52-1.08C(2), "Service Splice Test Criteria," all splices in the lot represented by this production test will be considered acceptable.

Should only 2 sample splices from a production test conform to the provisions in this Section 52-1.08C(2), "Service Splice Test Criteria," one additional production test shall be performed on the same lot of splices. This additional production test shall consist of testing 4 sample splices that have been randomly selected by the Engineer and removed by the Contractor from the actual completed lot of splices. Should any of the 4 splices from this additional test fail to conform to these provisions, all splices in the lot represented by these production tests will be rejected.

If only one sample splice from a production test conforms to the provisions in this Section 52-1.08C(2), "Service Splice Test Criteria," all splices in the lot represented by this production test will be rejected.

If a production test for a lot fails, the Contractor shall repair or replace all reinforcing bars from which sample splices were removed before the Engineer selects additional splices from this lot for further testing.

### **52-1.08C(2)(b) Quality Assurance Test Requirements for Service Splices**

For the first production test performed, and for at least one, randomly selected by the Engineer, of every 5 subsequent production tests, or portion thereof, the Contractor shall concurrently prepare 4 additional service quality assurance sample splices. These service quality assurance sample splices shall be prepared in the same manner as specified herein for service production sample splices.

These 4 additional quality assurance sample splices shall be shipped to the Transportation Laboratory for quality assurance testing. The 4 sample splices shall be securely bundled together and identified by location and contract number with weatherproof markings before shipment. Bundles containing fewer than 4 samples of splices will not be tested. Sample splices not accompanied by the supporting documentation required in Section 52-1.08B(1), for mechanical splices, or in Section 52-1.08B(3), for resistance butt welds, will not be tested.

Quality assurance testing will be performed in conformance with the requirements for service production sample splices in Section 52-1.08C(2)(a), "Production Test Requirements for Service Splices."

### **52-1.08C(3) Ultimate Butt Splice Test Criteria**

Ultimate production and quality assurance sample splices shall be tensile tested in conformance with the requirements described in ASTM Designation: A 370 and California Test 670.

A minimum of 1 control bar shall be removed from the same bar as, and adjacent to, all ultimate prequalification, production, and quality assurance sample splices. The lengths of control bars shall conform to the lengths specified for sample splices in California Test 670. The portion of adjacent bar remaining in the work shall also be identified with weatherproof markings that correspond to its adjacent control bar.

Each sample splice and its associated control bar shall be identified and marked as a set. Each set shall be identified as representing a prequalification, production, or quality assurance sample splice.

The portion of hoop reinforcing bar, removed to obtain a sample splice and control bar, shall be replaced using a prequalified ultimate mechanical butt splice, or the hoop shall be replaced in kind.

Reinforcing bars, other than hoops, from which sample splices are removed, shall be repaired using ultimate mechanical butt splices conforming to the provisions in Section 52-1.08C(1), "Splice Prequalification Report," or the bars shall be replaced in kind. These bars shall be repaired or replaced such that no splices are located in any "No Splice Zone" shown on the plans.

Ultimate production and quality assurance sample splices shall rupture in the reinforcing bar either: 1) outside of the affected zone or 2) within the affected zone, provided that the sample splice has achieved at least 95 percent of the ultimate tensile strength of the control bar associated with the sample splice. In addition, necking of the bar, as defined in California Test 670, shall occur at rupture regardless of whether the bar breaks inside or outside the affected zone.

The affected zone is the portion of the reinforcing bar where any properties of the bar, including the physical, metallurgical, or material characteristics, have been altered by fabrication or installation of the splice.

The ultimate tensile strength shall be determined for all control bars by tensile testing the bars to rupture, regardless of where each sample splice ruptures. If 2 control bars are tested for one sample splice, the bar with the lower ultimate tensile strength shall be considered the control bar.

#### **52-1.08C(3)(a) Production Test Requirements for Ultimate Butt Splices**

Production tests shall be performed for all ultimate butt splices used in the work. A production test shall consist of testing 4 sets of sample splices and control bars removed from each lot of completed splices, except when quality assurance tests are performed.

After the splices in a lot have been completed, and the bars have been epoxy-coated when required, the QCM shall notify the Engineer in writing that the splices in this lot conform to the specifications and are ready for testing. Except for hoops, sample splices will be selected by the Engineer at the job site. Sample splices for hoops will be selected by the Engineer either at the job site or a fabrication facility.

After notification has been received, the Engineer will randomly select the 4 sample splices to be removed from the lot and place tamper-proof markings or seals on them. The Contractor shall select the adjacent control bar for each sample splice bar, and the Engineer will place tamper-proof markings or seals on them. These ultimate production sample splices and control bars shall be removed by the Contractor, and tested by an independent qualified testing laboratory.

At least one week before testing, the Contractor shall notify the Engineer in writing of the date when and the location where the testing of the samples will be performed.

A sample splice or control bar from any set will be rejected if a tamper-proof marking or seal is disturbed before testing.

The 4 sets from each production test shall be securely bundled together and identified with a completed sample identification card before shipment to the independent laboratory. The card will be furnished by the Engineer. Bundles of samples containing fewer than 4 sets of splices shall not be tested.

Before performing any tensile tests on production test sample splices, one of the 4 sample splices shall be tested for, and shall conform to, the requirements for total slip. Should this sample splice not meet these requirements, one retest, in which the 3 remaining sample splices are tested for total slip, will be allowed. Should any of the 3 remaining sample splices not conform to these requirements, all splices in the lot represented by this production test will be rejected.

If 3 or more sample splices from a production test conform to the provisions in Section 52-1.08C(3), "Ultimate Butt Splice Test Criteria," all splices in the lot represented by this production test will be considered acceptable.

Should only 2 sample splices from a production test conform to the provisions in Section 52-1.08C(3), "Ultimate Butt Splice Test Criteria," one additional production test shall be performed on the same lot of splices. Should any of the 4 sample splices from this additional test fail to conform to these provisions, all splices in the lot represented by these production tests will be rejected.

If only one sample splice from a production test conforms to the provisions in Section 52-1.08C(3), "Ultimate Butt Splice Test Criteria," all splices in the lot represented by this production test will be rejected.

If a production test for a lot fails, the Contractor shall repair or replace all reinforcing bars from which sample splices were removed, complete in place, before the Engineer selects additional splices from this lot for further testing.

Production tests will not be required on repaired splices from a lot, regardless of the type of prequalified ultimate mechanical butt splice used to make the repair. However, should an additional production test be required, the Engineer may select any repaired splice for the additional production test.

#### **52-1.08C(3)(b) Quality Assurance Test Requirements for Ultimate Butt Splices**

For the first production test performed, and for at least one, randomly selected by the Engineer, of every 5 subsequent production tests, or portion thereof, the Contractor shall concurrently prepare 4 additional ultimate quality assurance sample splices along with associated control bars.

Each time 4 additional ultimate quality assurance sample splices are prepared, 2 of these quality assurance sample splice and associated control bar sets and 2 of the production sample splice and associated control bar sets,



together, shall conform to the requirements for ultimate production sample splices in Section 52-1.08C(3)(a), "Production Test Requirements for Ultimate Butt Splices."

The 2 remaining quality assurance sample splice and associated control bar sets, along with the 2 remaining production sample splice and associated control bar sets shall be shipped to the Transportation Laboratory for quality assurance testing. The 4 sets shall be securely bundled together and identified by location and contract number with weatherproof markings before shipment. Bundles containing fewer than 4 sets will not be tested.

Quality assurance testing will be performed in conformance with the requirements for ultimate production sample splices in Section 52-1.08C(3)(a), "Production Test Requirements for Ultimate Butt Splices."

#### **52-1.08C(3)(c) Nondestructive Splice Tests**

When the specifications allow for welded sample splices to be taken from other than the completed lot of splices, the Contractor shall meet the following additional requirements.

Except for resistance butt welded splices, radiographic examinations shall be performed on 25 percent of all complete joint penetration butt welded splices from a production lot. The size of a production lot will be a maximum of 150 splices. The Engineer will select the splices which will compose the production lot and also the splices within each production lot to be radiographically examined.

All required radiographic examinations of complete joint penetration butt welded splices shall be performed by the Contractor in conformance with the requirements in AWS D 1.4 and these specifications.

Before radiographic examination, welds shall conform to the requirements in Section 4.4, "Quality of Welds," of AWS D 1.4.

Should more than 12 percent of the splices which have been radiographically examined in any production lot be defective, an additional 25 percent of the splices, selected by the Engineer from the same production lot, shall be radiographically examined. Should more than 12 percent of the cumulative total of splices tested from the same production lot be defective, all remaining splices in the lot shall be radiographically examined.

Additional radiographic examinations performed due to the identification of defective splices shall be at the Contractor's expense.

All defects shall be repaired in conformance with the requirements in AWS D 1.4.

The Contractor shall notify the Engineer in writing 48 hours before performing any radiographic examinations.

The radiographic procedure used shall conform to the requirements in AWS D1.1, AWS D1.4, and the following:

- A. Two exposures shall be made for each complete joint penetration butt welded splice. For each of the 2 exposures, the radiation source shall be centered on each bar to be radiographed. The first exposure shall be made with the radiation source placed at zero degrees from the top of the weld and perpendicular to the weld root and identified with a station mark of "0." The second exposure shall be at 90 degrees to the "0" station mark and shall be identified with a station mark of "90." When obstructions prevent a 90 degree placement of the radiation source for the second exposure, and when approved in writing by the Engineer, the source may be rotated, around the centerline of the reinforcing bar, a maximum of 25 degrees.
- B. For field produced complete joint penetration butt welds, no more than one weld shall be radiographed during one exposure. For shop produced complete joint penetration butt welds, if more than one weld is to be radiographed during one exposure, the angle between the root line of each weld and the direction to the radiation source shall be not less than 65 degrees.
- C. Radiographs shall be made by either X-ray or gamma ray. Radiographs made by X-ray or gamma rays shall have densities of not less than 2.3 nor more than 3.5 in the area of interest. A tolerance of 0.05 in density is allowed for densitometer variations. Gamma rays shall be from the iridium 192 isotope and the emitting specimen shall not exceed 4.45 mm in the greatest diagonal dimension.
- D. The radiographic film shall be placed perpendicular to the radiation source at all times; parallel to the root line of the weld unless source placement determines that the film must be turned; and as close to the root of the weld as possible.
- E. The minimum source to film distance shall be maintained so as to ensure that all radiographs maintain a maximum geometric unsharpness of 0.020 at all times, regardless of the size of the reinforcing bars.
- F. Penetrators shall be placed on the source side of the bar and perpendicular to the radiation source at all times. One penetrator shall be placed in the center of each bar to be radiographed, perpendicular to the weld root, and adjacent to the weld. Penetrator images shall not appear in the weld area.
- G. When radiography of more than one weld is being performed per exposure, each exposure shall have a minimum of one penetrator per bar, or 3 penetrators per exposure. When 3 penetrators per exposure are used, one penetrator shall be placed on each of the 2 outermost bars of the exposure, and the remaining penetrator shall be placed on a centrally located bar.

- H. An allowable weld buildup of 4 mm may be added to the total material thickness when determining the proper penetrameter selection. No image quality indicator equivalency will be accepted. Wire penetrameters or penetrameter blocks shall not be used.
- I. Penetrameters shall be sufficiently shimmed using a radiographically identical material. Penetrameter image densities shall be a minimum of 2.0 and a maximum of 3.6.
- J. Radiographic film shall be Class 1, regardless of the size of reinforcing bars.
- K. Radiographs shall be free of film artifacts and processing defects, including, but not limited to, streaks, scratches, pressure marks or marks made for the purpose of identifying film or welding indications.
- L. Each splice shall be clearly identified on each radiograph and the radiograph identification and marking system shall be established between the Contractor and the Engineer before radiographic inspection begins. Film shall be identified by lead numbers only; etching, flashing or writing in identifications of any type will not be permitted. Each piece of film identification information shall be legible and shall include, as a minimum, the following information: Contractor's name, date, name of nondestructive testing firm, initials of radiographer, contract number, part number and weld number. The letter "R" and repair number shall be placed directly after the weld number to designate a radiograph of a repaired weld.
- M. Radiographic film shall be developed within a time range of one minute less to one minute more than the film manufacturer's recommended maximum development time. Sight development will not be allowed.
- N. Processing chemistry shall be done with a consistent mixture and quality, and processing rinses and tanks shall be clean to ensure proper results. Records of all developing processes and any chemical changes to the developing processes shall be kept and furnished to the Engineer upon request. The Engineer may request, at any time, that a sheet of unexposed film be processed in the presence of the Engineer to verify processing chemical and rinse quality.
- O. The results of all radiographic interpretations shall be recorded on a signed certification and a copy kept with the film packet.
- P. Technique sheets prepared in conformance with the requirements in ASME Boiler and Pressure Vessels Code, Section V, Article 2 Section T-291 shall also contain the developer temperature, developing time, fixing duration and all rinse times.

#### **52-1.08D Reporting Test Results**

A Production Test Report for all testing performed on each lot shall be prepared by the independent testing laboratory performing the testing and submitted to the QCM for review and approval. The report shall be signed by an engineer who represents the laboratory and is registered as a Civil Engineer in the State of California. The report shall include, as a minimum, the following information for each test: contract number, bridge number, lot number and location, bar size, type of splice, length of mechanical splice, length of test specimen, physical condition of test sample splice and any associated control bar, any notable defects, total measured slip, ultimate tensile strength of each splice, and for ultimate butt splices, limits of affected zone, location of visible necking area, ultimate tensile strength and 95 percent of this ultimate tensile strength for each control bar, and a comparison between 95 percent of the ultimate tensile strength of each control bar and the ultimate tensile strength of its associated splice.

The QCM must review, approve, and forward each Production Test Report to the Engineer for review before the splices represented by the report are encased in concrete. The Engineer will have 3 working days to review each Production Test Report and respond in writing after a complete report has been received. Should the Contractor elect to encase any splices before receiving notification from the Engineer, it is expressly understood that the Contractor will not be relieved of the responsibility for incorporating material in the work that conforms to the requirements of the plans and specifications. Material not conforming to these requirements will be subject to rejection. Should the Contractor elect to wait to encase splices pending notification by the Engineer, and in the event the Engineer fails to complete the review and provide notification within the time allowed, and if, in the opinion of the Engineer, the work is delayed or interfered with by reason of the Engineer's delay in completing the review, the Contractor will be compensated for any resulting loss, and an extension of time will be granted, in the same manner as provided for in Section 8-1.09, "Right of Way Delays."

Quality assurance test results for each bundle of 4 sets or 4 samples of splices will be reported in writing to the Contractor within 3 working days after receipt of the bundle by the Transportation Laboratory. In the event that more than one bundle is received on the same day, 2 additional working days shall be allowed for providing test results for each additional bundle received. A test report will be made for each bundle received. Should the Contractor elect to encase splices before receiving notification from the Engineer, it is expressly understood that the Contractor will not be relieved of the responsibility for incorporating material in the work that conforms to the requirements of the plans and specifications. Material not conforming to these requirements will be subject to rejection. Should the Contractor elect to wait to encase splices pending notification by the Engineer, and in the event the Engineer fails to complete the review within the time allowed, and in the opinion of the Engineer, completion of the work is delayed or interfered with by reason of the Engineer's delay in completing the review, the

Contractor will be compensated for any resulting loss, and an extension of time will be granted, in the same manner as provided for in Section 8-1.09, "Right of Way Delays."

**In Section 52-1.11 after the 7th paragraph, add:**

If a portion or all of the reinforcing steel is epoxy-coated more than 480 air line kilometers from both Sacramento and Los Angeles, additional shop inspection expenses will be sustained by the State. Whereas it is and will be impracticable and extremely difficult to ascertain and determine the actual increase in these expenses, it is agreed that payment to the Contractor for furnishing the epoxy-coated reinforcement will be reduced \$5000 for each epoxy-coating facility located more than 480 air line kilometers from both Sacramento and Los Angeles and an additional \$3000 (\$8000 total) for each epoxy-coating facility located more than 4800 air line kilometers from both Sacramento and Los Angeles.

[illegible]

## SECTION 53 SHOTCRETE

**(Issued 11-02-07)**

**In Section 53-1.01 replace the 3rd paragraph with:**

The dry-mix process shall consist of delivering dry mixed aggregate and cementitious material pneumatically or mechanically to the nozzle body and adding water and mixing the materials in the nozzle body. The wet-mix process shall consist of delivering mixed aggregate, cement, and water pneumatically to the nozzle and adding any admixture at the nozzle.

**In Section 53-1.02 replace the 1st, 2nd, 3rd and 4th paragraphs with:**

Cementitious material, fine aggregate, and mixing water shall conform to the provisions in Section 90, "Portland Cement Concrete."

Shotcrete to be mixed and applied by the dry-mix process shall consist of one part cementitious material to not more than 4.5 parts fine aggregate, thoroughly mixed in a dry state before being charged into the machine. Measurement may be either by volume or by mass. The fine aggregate shall contain not more than 6 percent moisture by mass.

Shotcrete to be mixed and applied by the wet-mix process shall consist of cementitious material, fine aggregate, and water and shall contain not less than 375 kilograms of cementitious material per cubic meter. A maximum of 30 percent pea gravel may be substituted for fine aggregate. The maximum size of pea gravel shall be such that 100 percent passes the 12.5 mm screen and at least 90 percent passes the 9.5 mm screen.

Admixtures may be added to shotcrete and shall conform to the provisions in Section 90-4, "Admixtures."

**In Section 53-1.04 in the 3rd paragraph, replace the 3rd subparagraph with:**

Aggregate and cementitious material that have been mixed for more than 45 minutes shall not be used unless otherwise permitted by the Engineer.

**Replace Section 53-1.07 with:**

### 53-1.07 MEASUREMENT

Quantities of shotcrete will be measured by the cubic meter computed from measurements, along the slope, of actual areas placed and the theoretical thickness shown on the plans. The Department does not pay for shotcrete placed outside the dimensions shown on the plans or to fill low foundation.

### **53-1.08 PAYMENT**

AA

**(Issued 05-02-08)**

Material Conforming to ASTM Designation: A 709/A 709M	CVN Impact Value (Joules at Temp.)
Grade 36 [250]	20 at 4°C
Grade 50 [345]* (50 mm and under in thickness)	20 at 4°C
Grade 50W [345W]* (50 mm and under in thickness)	20 at 4°C
Grade 50 [345]* (Over 50 mm to 100 mm in thickness)	27 at 4°C
Grade 50W [345W]* (Over 50 mm to 100 mm in thickness)	27 at 4°C
Grade HPS 50W [345W]* (100 mm and under in thickness)	27 at -12°C
Grade HPS 70W [485]* (100 mm and under in thickness)	34 at -23°C
Grade 100 [490] (65 mm and under in thickness)	34 at -18°C
Grade 100W [490W] (Over 65 mm to 100 mm in thickness)	48 at -18°C

\* If the yield point of the material exceeds 450 MPa, the temperature for the CVN impact value for acceptability shall be reduced 8°C for each increment of 70 MPa above 450 MPa.

#### Structural Steel Materials

Material	Specification
Structural steel:	
Carbon steel	ASTM: A 709/A 709M, Grade 36 [250] or {A 36/A 36M}a
High strength low alloy columbium vanadium steel	ASTM: A 709/A 709M, Grade 50 [345] or {A 572/A 572M, Grade 50 [345]}a
High strength low alloy structural steel	ASTM: A 709/A 709M, Grade 50W [345W], Grade HPS 50W [HSP 345W], or {A 588/A 588M}a
High strength low alloy structural steel plate	ASTM: A 709/A 709M, Grade HPS 70W [HPS 485W]
High-yield strength, quenched and tempered alloy steel plate suitable for welding	ASTM: A 709/A 709M, Grade 100 [690] and Grade 100W [690W], or {A 514/A 514M}a
Steel fastener components for general applications:	
Bolts and studs	ASTM: A 307
Headed anchor bolts	ASTM: A 307, Grade B, including S1 supplementary requirements
Nonheaded anchor bolts	ASTM: A 307, Grade C, including S1 supplementary requirements and S1.6 of AASHTO: M 314 supplementary requirements or AASHTO: M 314, Grade 36 or 55, including S1 supplementary requirements
High-strength bolts and studs	ASTM: A 449, Type 1
High-strength threaded rods	ASTM: A 449, Type 1
High-strength nonheaded anchor bolts	ASTM: A 449, Type 1
Nuts	ASTM: A 563, including Appendix X1b
Washers	ASTM: F 844

Components of high-strength steel fastener assemblies for use in structural steel joints:	
Bolts	ASTM: A 325, Type 1
Tension control bolts	ASTM: F 1852, Type 1
Nuts	ASTM: A 563, including Appendix X1b
Hardened washers	ASTM : F 436, Type 1, Circular, including S1 supplementary requirements
Direct tension indicators	ASTM: F 959, Type 325, zinc-coated
Carbon steel for forgings, pins and rollers	ASTM: A 668/A 668M, Class D
Alloy steel for forgings	ASTM: A 668/A 668M, Class G
Pin nuts	ASTM: A 36/A 36M
Carbon-steel castings	ASTM: A 27/A 27M, Grade 65-35, Class 1
Malleable iron castings	ASTM: A 47, Grade 32510 or A 47M, Grade 22010
Gray iron castings	ASTM: A 48, Class 30B
Carbon steel structural tubing	ASTM: A 500, Grade B or A 501
Steel pipe (Hydrostatic testing will not apply)	ASTM: A 53, Type E or S, Grade B; A 106, Grade B; or A 139, Grade B
Stud connectors	ASTM: A 108 and AASHTO/AWS D1.5

- a Grades that may be substituted for the equivalent ASTM Designation: A 709 steel, at the Contractor's option, subject to the modifications and additions specified and to the requirements of A 709.
- b Zinc-coated nuts that will be tightened beyond snug or wrench tight shall be furnished with a dry lubricant conforming to Supplementary Requirement S2 in ASTM Designation: A 563.

**In Section 55-2.02 in the 1st paragraph, replace the 1st sentence with:**

Unless otherwise specified or shown on the plans, all structural steel plates, shapes, and bars shall conform to ASTM Designation: A 709/A 709M, Grade 50 [345].

**In Section 55-3.05 replace the 1st paragraph with:**

Surfaces of bearing and base plates and other metal surfaces that are to come in contact with each other or with ground concrete surfaces or with asbestos sheet packing shall be flat to within one mm tolerance in 305 mm and to within 2 mm tolerance overall. Surfaces of bearing and base plates and other metal bearing surfaces that are to come in contact with preformed fabric pads, elastomeric bearing pads, or mortar shall be flat to within 3 mm tolerance in 305 mm and to within 5 mm tolerance overall.

**In Section 55-3.14, after the 9th paragraph add:**

If a torque multiplier is used in conjunction with a calibrated wrench as a method for tightening fastener assemblies to the required tension, both the multiplier and the wrench shall be calibrated together as a system. The same length input and output sockets and extensions that will be used in the work shall also be included in the calibration of the system. The manufacturer's torque multiplication ratio shall be adjusted during calibration of the system, such that when this adjusted ratio is multiplied by the actual input calibrated wrench reading, the product is a calculated output torque that is within 2 percent of the true output torque. When this system is used in the work to perform any installation tension testing, rotational capacity testing, fastener tightening, or tension verification, it shall be used, intact as calibrated.

**In Section 55-3.17 replace the 2nd paragraph with:**

The minimum size of all fillet welds, except those to reinforce groove welds, shall be as shown in the following table:



**Replace Section 56-1.02B with:**

**56-1.02B Sheets**

Sheets shall be carbon-steel sheets conforming to the requirements in ASTM Designation: A 1011/A 1011M, Designation SS, Grade 33[230].

Ribbed sheet metal for box beam-closed truss sign structures shall be fabricated from galvanized sheet steel conforming to the requirements in ASTM Designation: A 653/A 653M, Designation SS, Grade 33[230]. Sheet metal panels shall be G 165 coating designation in conformance with the requirements in ASTM Designation: A 653/A 653M.

**Replace Section 56-1.02F with:**

**56-1.02F Steel Walkway Gratings**

Steel walkway gratings shall be furnished and installed in conformance with the details shown on the plans and the following provisions:

- A. Gratings shall be the standard product of an established grating manufacturer.
- B. Material for gratings shall be structural steel conforming to the requirements in ASTM Designation: A 1011/A 1011M, Designation CS, Type B.
- C. For welded type gratings, each joint shall be full resistance welded under pressure, to provide a sound, completely beaded joint.
- D. For mechanically locked gratings, the method of fabrication and interlocking of the members shall be approved by the Engineer, and the fabricated grating shall be equal in strength to the welded type.
- E. Gratings shall be accurately fabricated and free from warps, twists, or other defects affecting their appearance or serviceability. Ends of all rectangular panels shall be square. The tops of the bearing bars and cross members shall be in the same plane. Gratings distorted by the galvanizing process shall be straightened.

**In Section 56-1.03 replace the 5th through the 13th paragraphs with:**

Clips, eyes, or removable brackets shall be affixed to all signs and all posts and shall be used to secure the sign during shipping and for lifting and moving during erection as necessary to prevent damage to the finished galvanized or painted surfaces. Brackets on tubular sign structures shall be removed after erection. Details of the devices shall be shown on the working drawings.

High-strength bolted connections, where shown on the plans, shall conform to the provisions in Section 55-3.14, "Bolted Connections," except that only fastener assemblies consisting of a high-strength bolt, nut, hardened washer, and direct tension indicator shall be used.

High-strength fastener assemblies, and any other bolts, nuts, and washers attached to sign structures shall be zinc-coated by the mechanical deposition process.

Nuts for high-strength bolts designated as snug-tight shall not be lubricated.

An alternating snugging and tensioning pattern for anchor bolts and high-strength bolted splices shall be used. Once tensioned, high-strength fastener components and direct tension indicators shall not be reused.

For bolt diameters less than 10 mm, the diameter of the bolt hole shall be not more than 0.80-mm larger than the nominal bolt diameter. For bolt diameters greater than or equal to 10 mm, the diameter of the bolt hole shall be not more than 1.6 mm larger than the nominal bolt diameter.

Sign structures shall be fabricated into the largest practical sections prior to galvanizing.

Ribbed sheet metal panels for box beam closed truss sign structures shall be fastened to the truss members by cap screws or bolts as shown on the plans, or by 4.76 mm stainless steel blind rivets conforming to Industrial Fasteners Institute, Standard IFI-114, Grade 51. The outside diameter of the large flange rivet head shall be not less than 15.88 mm in diameter. Web splices in ribbed sheet metal panels may be made with similar type blind rivets of a size suitable for the thickness of material being connected.

Spalling or chipping of concrete structures shall be repaired by the Contractor at the Contractor's expense.

**In Section 56-1.03 after the 13th paragraph add:**

Overhead sign supports shall have an aluminum identification plate permanently attached near the base, adjacent to the traffic side on one of the vertical posts, using either stainless steel rivets or stainless steel screws. As a minimum, the information on the plate shall include the name of the manufacturer, the date of manufacture and the contract number.



The contract price paid per kilogram for install sign structure of the type or types designated in the Engineer's Estimate shall include full compensation for furnishing all labor, materials, tools, equipment and incidentals, and for doing all the work involved in installing sign structures, complete in place, including installing anchor bolt assemblies, removable sign panel frames, and sign panels and performing any welding, painting or galvanizing required during installation, as shown on the plans, as specified in these specifications and the special provisions, and as directed by the Engineer.

Douglas fir and Hem-Fir posts shall be treated in conformance with the provisions in Section 58, "Preservative Treatment of Lumber, Timber and Piling," and in conformance with AWPAs Use Category System: UC4A, Commodity Specification A. Posts shall be incised and the minimum retention of preservative shall be as specified in AWPAs Standards.

Backfill material for metal posts shall consist of minor concrete conforming to the provisions in Section 90-10, "Minor Concrete," and shall contain not less than 275 kilograms of cementitious material per cubic meter.

**(Issued 10-12-04)**

When preservative treatment of timber and lumber is required, the treatment shall conform to the provisions in Section 58, "Preservative Treatment of Lumber, Timber and Piling," and AWPAs Use Category 4B. The type of treatment to be used will be shown on the plans or specified in the special provisions.

**(Issued 11-18-05)**

Timber, lumber, and piling shall be pressure treated after millwork is completed. Preservatives, treatment, and results of treatment shall conform to the requirements in AWPA Standards U1 and T1. Treatment of lumber and timber shall conform to the specified AWPA Use Category cited in the special provisions, on the plans, or elsewhere in these specifications.

Contract No. 04-0120T4  
161 of 220

## **SECTION 59 PAINTING**

**(Issued 01-19-07)**

### **In Section 59-1.02 replace the 1st paragraph with:**

Paint shall be applied only on thoroughly dry surfaces and during periods of favorable weather. Blast cleaning or application of solvent-borne paint will not be permitted when the atmospheric or surface temperature is at or below 2°C or above 38°C, or when the relative humidity exceeds 85 percent at the site of the work. Application of water-borne paint will not be permitted when the atmospheric or surface temperature is at or below 10°C, or above 38°C, or when the relative humidity exceeds 75 percent at the site of the work. Application of paint will not be permitted when the steel surface temperature is less than 3°C above the dew point, or when freshly painted surfaces may become damaged by rain, fog or condensation, or when it can be anticipated that the atmospheric temperature or relative humidity will not remain within the specified application conditions during the drying period, except as provided in the following paragraph for enclosures. If uncured paint is damaged by the elements, it shall be replaced or repaired by the Contractor at the Contractor's expense.

### **In Section 59-1.05 replace the 2nd paragraph with:**

Paint or paint stains on surfaces not designated to be painted shall be removed by the Contractor at the Contractor's expense and to the satisfaction of the Engineer.

### **In Section 59-2.01, between the 1st and 2nd paragraph add:**

Unless otherwise specified, no painting Contractors or subcontractors will be permitted to commence work without having the following current "SSPC: The Society for Protective Coatings" (formerly the Steel Structures Painting Council) certifications in good standing:

- A. For cleaning and painting structural steel in the field, certification in conformance with the requirements in Qualification Procedure No. 1, "Standard Procedure For Evaluating Painting Contractors (Field Application to Complex Industrial Structures)" (SSPC-QP 1).
- B. For removing paint from structural steel, certification in conformance with the requirements in Qualification Procedure No. 2, "Standard Procedure For Evaluating Painting Contractors (Field Removal of Hazardous Coatings from Complex Structures)" (SSPC-QP 2).
- C. For cleaning and painting structural steel in a permanent painting facility, certification in conformance with the requirements in Qualification Procedure No. 3, "Standard Procedure For Evaluating Qualifications of Shop Painting Applicators" (SSPC-QP 3). The AISC's Sophisticated Paint Endorsement (SPE) quality program will be considered equivalent to SSPC-QP 3.

### **In Section 59-2.03 replace the 3rd paragraph with:**

Exposed steel or other metal surfaces to be blast cleaned shall be cleaned in conformance with the requirements in Surface Preparation Specification No. 6, "Commercial Blast Cleaning," of the "SSPC: The Society for Protective Coatings." Blast cleaning shall leave all surfaces with a dense, uniform, angular anchor pattern of not less than 35 µm as measured in conformance with the requirements in ASTM Designation: D 4417.

### **In Section 59-2.06 replace the 1st paragraph with:**

Dirt, loose rust and mill scale, or paint which is not firmly bonded to the surfaces shall be removed in conformance with the requirements in Surface Preparation Specification No. 2, "Hand Tool Cleaning," of the "SSPC: The Society for Protective Coatings." Edges of old remaining paint shall be feathered.

### **In Section 59-2.12 replace the 3rd and 4th paragraphs with:**

Contact surfaces of stiffeners, railings, built up members or open seam exceeding 6 mils in width that would retain moisture, shall be caulked with polysulfide or polyurethane sealing compound conforming to the requirements in ASTM Designation: C 920, Type S, Grade NS, Class 25, Use O, or other approved material.

The dry film thickness of the paint will be measured in place with a calibrated Type 2 magnetic film thickness gage in conformance with the requirements in SSPC-PA 2, "Measurement of Dry Coating Thickness with Magnetic

Gages," of the "SSPC: The Society for Protective Coatings," except that there shall be no limit to the number or location of spot measurements to verify compliance with specified thickness requirements.

**In Section 59-2.13 replace the 3rd paragraph with:**

Mechanical mixers shall be used in mixing the primer. After mixing, the zinc-rich primer shall be strained through a 0.6 to 0.25 mm screen or a double layer of cheesecloth immediately prior to or during pouring into the spray pot.

[illegible]

## SECTION 64 PLASTIC PIPE

**(Issued 07-31-07)**

**In Section 64-1.06 replace the 1st paragraph with:**

At locations where pipe is to be backfilled with concrete as shown on the plans, the concrete backfill shall be constructed of minor concrete or Class 4 concrete conforming to the provisions in Section 90, "Portland Cement Concrete." Minor concrete shall contain not less than 250 kg of cementitious material per cubic meter. The concrete to be used will be designated in the contract item or shown on the plans.

**In Section 64-1.06 replace the 3rd paragraph with:**

The surface of the concrete backfill shall be broomed with a heavy broom to produce a uniform rough surface if hot mix asphalt is to be placed directly thereon.

[illegible]

## SECTION 65 REINFORCED CONCRETE PIPE

**(Issued 07-31-07)**

**In Section 65-1.02 replace the 1st paragraph with:**

Cementitious material and aggregate shall conform to the provisions in Section 90-2, "Materials," except that mortar strengths relative to Ottawa sand and grading requirements shall not apply to the aggregate. Use of supplemental cementitious material shall conform to AASHTO Designation: M 170M.

**In Section 65-1.02A(1) in the 11th paragraph, replace item C with:**

- c. Cementitious material and aggregate for non-reinforced concrete pipe shall conform to the provisions in Section 65-1.02, "Materials."

**In Section 65-1.035 replace the 1st paragraph with:**

At locations where pipe is to be backfilled with concrete as shown on the plans, the concrete backfill shall be constructed of minor concrete or Class 4 concrete in conformance with the provisions in Section 90, "Portland Cement Concrete." Minor concrete shall contain not less than 225 kg of cementitious material per cubic meter. The concrete to be used will be designated in the contract item.

**In Section 65-1.035 replace the 3rd paragraph with:**

The surface of the concrete backfill shall be broomed with a heavy broom to produce a uniform rough surface if hot mix asphalt is to be placed directly thereon.

**In Section 65-1.06 in the 2nd paragraph, replace the 1st subparagraph with:**

Cement Mortar.- Mortar shall be composed of one part cementitious material and 2 parts sand by volume. Supplementary cementitious material will not be required.

^^

**SECTION 66 CORRUGATED METAL PIPE**  
**(Issued 07-31-07)**

**In Section 66-1.045 replace the 1st paragraph with:**

At locations where pipe is to be backfilled with concrete as shown on the plans, the concrete backfill shall be constructed of minor concrete or Class 4 concrete conforming to the provisions in Section 90, "Portland Cement Concrete." Minor concrete shall contain not less than 225 kg of cementitious material per cubic meter. The concrete to be used will be designated in the contract item or shown on the plans.

**In Section 66-1.045 replace the 3rd paragraph with:**

The surface of the concrete backfill shall be broomed with a heavy broom to produce a uniform rough surface if hot mix asphalt is to be placed directly thereon.

^^

**SECTION 68 SUBSURFACE DRAINS**  
**(Issued 07-31-07)**

**In Section 68-3.02D replace the 1st and 2nd paragraphs with:**

Concrete for splash pads shall be produced from minor concrete conforming to the provisions in Section 90-10, "Minor Concrete." Minor concrete shall contain not less than 275 kg of cementitious material per cubic meter.

Mortar placed where edge drain outlets and vents connect to drainage pipe and existing drainage inlets shall conform to the provisions in Section 51-1.135, "Mortar."

**In Section 68-3.03 replace the 13th paragraph with:**

Cement treated permeable material, which is not covered with hot mix asphalt within 12 hours after compaction of the permeable material, shall be cured by either sprinkling the material with a fine spray of water every 4 hours during daylight hours or covering the material with a white polyethylene sheet, not less than 6 mils thick. The above curing requirements shall begin at 7:00 a.m. on the morning following compaction of the cement treated permeable material and continue for the next 72 hours or until the material is covered with hot mix asphalt, whichever is less. The cement treated permeable material shall not be sprayed with water during the first 12 hours after compacting, but may be covered with the polyethylene sheet during the first 12 hours or prior to the beginning of the cure period.

**In Section 68-3.03 replace the 17th and 18th paragraphs with:**

Hot mix asphalt for backfilling trenches in existing paved areas shall be produced from commercial quality aggregates and asphalt and mixed at a central mixing plant. The aggregate shall conform to the 19 mm grading, or the 12.5 mm grading for Type A and Type B hot mix asphalt specified in Section 39-1.02E, "Aggregate." The amount of asphalt binder to be mixed with the aggregate shall be between 4 percent and 7 percent by weight of the dry aggregate, as determined by the Engineer.

Hot mix asphalt backfill shall be spread and compacted in approximately 2 equal layers by methods that will produce a hot mix asphalt surfacing of uniform smoothness, texture and density. Each layer shall be compacted before the temperature of the mixture drops below 120°C. Prior to placing the hot mix asphalt backfill, a tack coat of asphaltic emulsion conforming to the provisions in Section 94, "Asphaltic Emulsions," shall be applied to the vertical edges of existing pavement at an approximate rate of 0.25 liters per square meter.

Type A pavement markers conforming to the details shown on the plans and the provisions in Section 85, "Pavement Markers," shall be placed on paved shoulders or dikes at outlet, vent and cleanout locations as directed by the Engineer. The waiting period for placing pavement markers on new hot mix asphalt surfacing will not apply.

### 68-3.05 PAYMENT

The contract price paid per meter for plastic pipe (edge drain outlet) of the size or sizes shown in the Engineer's Estimate shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals and for doing all the work involved in installing edge drain outlets, vents and cleanouts complete in place, including outlet and vent covers, expansion plugs, pavement markers, concrete splash pads, connecting outlets and vents to drainage facilities, and excavation and backfill [aggregate base, hot mix asphalt, tack coat, and native material] for outlets, vents, and cleanouts to be installed in embankments and existing shoulders, as shown on the plans, as specified in these specifications and the special provisions, and as directed by the Engineer.

## **SECTION 70 MISCELLANEOUS FACILITIES**

**(Issued 01-05-07)**

### **In Section 70-1.02C replace the 2nd paragraph with:**

Precast concrete flared end sections shall conform to the requirements for Class III Reinforced Concrete Pipe in AASHTO Designation: M 170M. Cementitious materials and aggregate shall conform to the provisions in Section 90-2, "Materials," except that mortar strengths relative to Ottawa sand and grading requirements shall not apply to the aggregate. Use of supplementary cementitious material shall conform to the requirements in AASHTO Designation: M 170M. The area of steel reinforcement per meter of flared end section shall be at least equal to the minimum steel requirements for circular reinforcement in circular pipe for the internal diameter of the circular portion of the flared end section. The basis of acceptance of the precast concrete flared end section shall conform to the requirements of Section 5.1.2 of AASHTO Designation: M 170M.

### **In Section 70-1.02H replace the 1st paragraph with:**

Precast concrete pipe risers and pipe reducers, and precast concrete pipe sections, adjustment rings and tapered sections for pipe energy dissipators, pipe inlets and pipe manholes shall conform to the requirements in AASHTO Designation: M 199M, except that the cementitious material and aggregate shall conform to the provisions in Section 90-2, "Materials," except that mortar strengths relative to Ottawa sand and grading requirements shall not apply to the aggregate. Use of supplementary cementitious material shall conform to the requirements in AASHTO Designation: M 170M.

### **In Section 70-1.03 replace the 2nd paragraph with:**

Cutoff walls for precast concrete flared end sections shall be constructed of minor concrete conforming to the provisions in Section 90-10, "Minor Concrete." Minor concrete shall contain not less than 275 kg of cementitious material per cubic meter.

^^

## **SECTION 72 SLOPE PROTECTION**

**(Issued 11-18-05)**

### **In Section 72-4.04 replace the 6th paragraph with:**

Pervious backfill material, if required by the plans, shall be placed as shown. A securely tied sack containing 0.03-m<sup>3</sup> of pervious backfill material shall be placed at each weep hole and drain hole. The sack material shall conform to the provisions in Section 88-1.03, "Filter Fabric."

^^

## **SECTION 73 CONCRETE CURBS AND SIDEWALKS**

**(Issued 07-31-07)**

### **In Section 73-1.01 in the 2nd paragraph, replace item 2 with:**

2. Minor concrete shall contain not less than 275 kg of cementitious material per cubic meter except that when extruded or slip-formed curbs are constructed using 9.5-mm maximum size aggregate, minor concrete shall contain not less than 325 kg of cementitious material per cubic meter.

**In Section 73-1.06 replace the 15th paragraph with:**

Where hot mix asphalt or portland cement concrete pavements are to be placed around or adjacent to manholes, pipe inlets or other miscellaneous structures in sidewalk, gutter depression, island paving, curb ramps or driveway areas, the structures shall not be constructed to final grade until after the pavements have been constructed for a reasonable distance on each side of the structures.

**A A**

## SECTION 74 PUMPING PLANT EQUIPMENT

**(Issued 07-01-08)**

**In Section 74-1.02 delete the 2nd paragraph.**

AA

## SECTION 75 MISCELLANEOUS METAL

**(Issued 01-18-08)**

**In Section 75-1.02 in the 10th paragraph, replace the table with:**

Material	Specification
Steel bars, plates and shapes	ASTM Designation: A 36/A 36M or A 575, A 576 (AISI or M Grades 1016 through 1030)
Steel fastener components for general applications:	
Bolts and studs	ASTM Designation: A 307
Headed anchor bolts	ASTM Designation: A 307, Grade B, including S1 supplementary requirements
Nonheaded anchor bolts	ASTM Designation: A 307, Grade C, including S1 supplementary requirements and S1.6 of AASHTO Designation: M 314 supplementary requirements or AASHTO Designation: M 314, Grade 36 or 55, including S1 supplementary requirements
High-strength bolts and studs, threaded rods, and nonheaded anchor bolts	ASTM Designation: A 449, Type 1
Nuts	ASTM Designation: A 563, including Appendix X1*
Washers	ASTM Designation: F 844
Components of high-strength steel fastener assemblies for use in structural steel joints:	
Bolts	ASTM Designation: A 325, Type 1
Tension control bolts	ASTM Designation: F 1852, Type 1
Nuts	ASTM Designation: A 563, including Appendix X1*
Hardened washers	ASTM Designation: F 436, Type 1, Circular, including S1 supplementary requirements
Direct tension indicators	ASTM Designation: F 959, Type 325, zinc-coated
Stainless steel fasteners (Alloys 304 & 316) for general applications:	
Bolts, screws, studs, threaded rods, and nonheaded anchor bolts	ASTM Designation: F 593 or F 738M
Nuts	ASTM Designation: F 594 or F 836M
Washers	ASTM Designation: A 240/A 240M and ANSI B 18.22M
Carbon-steel castings	ASTM Designation: A 27/A 27M, Grade 65-35 [450-240], Class 1
Malleable iron castings	ASTM Designation: A 47, Grade 32510 or A 47M, Grade 22010
Gray iron castings	ASTM Designation: A 48, Class 30B
Ductile iron castings	ASTM Designation: A 536, Grade 65-45-12
Cast iron pipe	Commercial quality
Steel pipe	Commercial quality, welded or extruded
Other parts for general Applications	Commercial quality

\* Zinc-coated nuts that will be tightened beyond snug or wrench tight shall be furnished with a dyed dry lubricant conforming to Supplementary Requirement S2 in ASTM Designation: A 563.

**In Section 75-1.03 replace the 2nd paragraph with:**

Miscellaneous bridge metal shall consist of the following, except as further provided in Section 51-1.19, "Utility Facilities," and in the special provisions:



- A. Bearing assemblies, equalizing bolts and expansion joint armor in concrete structures.
- B. Expansion joint armor in steel structures.
- C. Manhole frames and covers, frames and grates, ladder rungs, guard posts and access door assemblies.
- D. Deck drains, area drains, retaining wall drains, and drainage piping, except drainage items identified as "Bridge Deck Drainage System" in the special provisions.

**In Section 75-1.03 replace the 7th paragraph with:**

Sheet steel for access doors shall be galvanized sheet conforming to the requirements in ASTM Designation: A 653/A 653M, Coating Designation Z600 {G210}.

**In Section 75-1.03 replace the 13th paragraph with:**

Concrete anchorage devices shall be mechanical expansion or resin capsule types installed in drilled holes or cast-in-place insert types. The anchorage devices shall be selected from the Department's Pre-Qualified Products List at:

[http://www.dot.ca.gov/hq/esc/approved\\_products\\_list](http://www.dot.ca.gov/hq/esc/approved_products_list)

The anchorage devices shall be a complete system, including threaded studs, hex nuts, and cut washers. Thread dimensions for externally threaded concrete anchorage devices prior to zinc coating, shall conform to the requirements in ANSI Standard: B1.1 having Class 2A tolerances or ANSI Standard: B1.13M having Grade 6g tolerances. Thread dimensions for internally threaded concrete anchorage devices shall conform to the requirements in ASTM A 563.

**In Section 75-1.03 replace the 18th paragraph with:**

Mechanical expansion anchors shall, when installed in accordance with the manufacturer's instructions and these specifications and tested in conformance with the requirements in California Test 681, withstand the application of a sustained tension test load of at least the following values for at least 48 hours with a movement not greater than 0.90 mm:

Stud Diameter (millimeters)	Sustained Tension Test Load (kilonewtons)
*18.01-21.00	22.2
15.01-18.00	18.2
12.01-15.00	14.2
9.01-12.00	9.34
6.00-9.00	4.23

\* Maximum stud diameter permitted for mechanical expansion anchors.

Resin capsule anchors shall, when installed in accordance with the manufacturer's instructions and these specifications and tested in conformance with the requirements in California Test 681, withstand the application of a sustained tension test load of at least the following values for at least 48 hours with a movement not greater than 0.25 mm:

Stud Diameter (millimeters)	Sustained Tension Test Load (kilonewtons)
29.01-33.00	137.9
23.01-29.00	79.6
21.01-23.00	64.1
18.01-21.00	22.2
15.01-18.00	18.2
12.01-15.00	14.2
9.01-12.00	9.34
6.00-9.00	4.23

At least 25 days before use, the Contractor shall submit one sample of each resin capsule anchor per lot to the Transportation Laboratory for testing. A lot of resin capsule anchors is 100 units, or fraction thereof, of the same brand and product name.

**In Section 75-1.03 in the 19th paragraph, replace the table with:**

Stud Diameter (millimeters)	Ultimate Tensile Load (kilonewtons)
30.01-33.00	112.1
27.01-30.00	88.1
23.01-27.00	71.2
20.01-23.00	51.6
16.01-20.00	32.0
14.01-16.00	29.4
12.00-14.00	18.7

**In Section 75-1.03, replace the 20th paragraph with:**

The Pre-Qualified Products List for concrete anchorage devices has been developed from data previously furnished by suppliers or manufacturers for each type and size. Approval of additional anchorage device types and sizes is contingent upon the Contractor submitting to the Engineer one sample of each type of concrete anchorage device, manufacturer's installation instructions, and certified results of tests, either by a private testing laboratory or the manufacturer, indicating compliance with the above requirements.

**In Section 75-1.03 in the 22nd paragraph, replace the table with:**

Installation Torque Values, (newton meters)

Stud Diameter (millimeters)	Shell Type Mechanical Expansion Anchors	Integral Stud Type Mechanical Expansion Anchors	Resin Capsule Anchors and Cast-in-Place Inserts
29.01-33.00	—	—	540
23.01-29.00	—	—	315
21.01-23.00	—	—	235
18.01-21.00	110	235	200
15.01-18.00	45	120	100
12.01-15.00	30	65	40
9.01-12.00	15	35	24
6.00-9.00	5	10	—

**In Section 75-1.03, replace the 24th paragraph with:**

Sealing compound, for caulking and adhesive sealing, shall be a polysulfide or polyurethane material conforming to the requirements in ASTM Designation: C 920, Type S, Grade NS, Class 25, Use O.

Cables shall be 19 mm preformed, 6 x 19, wire strand core or independent wire rope core (IWRC), galvanized in conformance with the requirements in Federal Specification RR-W-410, right regular lay, manufactured of improved plow steel with a minimum breaking strength of 200 kN. Two certified copies of mill test reports of each manufactured length of cable used shall be furnished to the Engineer.

Concrete for filling cable drum units shall conform to the provisions in Section 90-10, "Minor Concrete," or at the option of the Contractor, may be a mix with 9.5 mm maximum size aggregate and not less than 400 kilograms of cementitious material per cubic meter.

At the option of the Contractor, material thinner than 3.2 mm shall be galvanized either before fabrication in conformance with the requirements of ASTM Designation: A 653/A 653M, Coating Designation Z600, or after fabrication in conformance with the requirements of ASTM Designation: A 123, except that the weight of zinc coating shall average not less than 365 g per square meter of actual surface area with no individual specimen having a coating weight of less than 305 g per square meter.

Posts and braces to be treated shall be pressure treated in conformance with the provisions in Section 58, "Preservative Treatment of Lumber, Timber and Piling," and AWP A Use Category System: UC4A, Commodity Specification A or B.

Portland cement concrete for metal post and brace footings and for deadmen shall be minor concrete conforming to the provisions in Section 90-10, "Minor Concrete." Minor concrete shall contain not less than 275 kg of cementitious material per cubic meter.

Portland cement concrete for metal post and for deadmen shall be produced from minor concrete conforming to the provisions in Section 90-10, "Minor Concrete." Minor concrete shall contain not less than 275 kg of cementitious material per cubic meter.

At the option of the Contractor, the frame and cover for Type B and Type D survey monuments shall be fabricated from either cast steel or gray cast iron. The covers shall fit into the frames without rocking.

**In Section 81-1.02 replace the 7th paragraph with:**

Granular material for Type B and Type D survey monuments shall be gravel, crushed gravel, crushed rock or any combination thereof. Granular material shall not exceed 37.5 mm in greatest dimension.

^^

**SECTION 82 MARKERS AND DELINEATORS**  
**(Issued 06-30-06)**

**In Section 82-1.02B replace the 1st paragraph with:**

Steel for metal posts shall conform to the requirements in ASTM Designation: A 36/A 36M. The posts shall be galvanized in conformance with the requirements in Section 75-1.05, "Galvanizing."

**In Section 82-1.02D replace the 3rd paragraph with:**

The zinc-coated steel sheet shall conform to the requirements in ASTM Designation: A 653/A 653M, Classification: Commercial Steel (CS Types A, B and C). The steel sheets shall be galvanized in conformance with the requirements in Section 75-1.05, "Galvanizing." The zinc-coated surface shall be prepared for painting in a manner designed to produce optimum paint adherence. The surface preparation shall be accomplished without damaging or removing the zinc coating. Any evidence of damage or removal of the zinc coating shall be cause for rejection of the entire lot.

**In Section 82-1.02D replace the 11th paragraph with:**

When tested in conformance with the requirements in California Test 671, the painted metal target plates shall, in general, have satisfactory resistance to weathering, humidity, salt spray and chemicals; the enamel coating shall have satisfactory adherence and impact resistance, a pencil lead hardness of HB minimum, 60° specular gloss of 80 percent minimum, an excitation purity of 3 percent maximum as received and after 1000 hours in an artificial weathering device in conformance with the requirements in ASTM Designation: G 155, Table X3.1, Cycle 1, and a daylight luminous directional reflectance ("Y" value) of 70 minimum.

**In Section 82-1.02F replace the 2nd paragraph with:**

Reflectors for flexible target plates on Type K object markers and target plates on Class 2 delineators, and reflectors for Class 1 delineators shall be made from impact resistant retroreflective sheeting as specified in the special provisions. The color of the retroreflective sheeting shall conform to the color designated on the plans and the Chromaticity Coordinates specified in ASTM Designation: D 4956, or the PR color number specified by the Federal Highway Administration's Color Tolerance Chart.

**In Section 82-1.02F replace the 4th paragraph with:**

The instrumental method of determining color shall conform to the requirements specified in ASTM Designation: D 4956. In the event of any dispute concerning the test results of instrumental testing, the visual test shall prevail.

^^

**SECTION 83 RAILINGS AND BARRIERS**  
**(Issued 08-17-07)**

**In Section 83-1.02 replace the 7th paragraph with:**

Mortar shall conform to the provisions in Section 51-1.135, "Mortar," and shall consist of one part by volume of cementitious material and 3 parts of clean sand.

**In Section 83-1.02B replace the 1st paragraph with:**

The rail elements, backup plates, terminal sections, end and return caps, bolts, nuts and other fittings shall conform to the requirements in AASHTO Designation: M 180, except as modified in this Section 83-1.02B and as specified in Section 83-1.02. The rail elements, backup plates, terminal sections, end and return caps shall conform to Class A, Type 1 W-Beam guard railing as shown in AASHTO Designation: M 180. The edges and center of the rail element shall contact each post block. Rail element joints shall be lapped not less than 316 mm and bolted. The rail metal, in addition to conforming to the requirements in AASHTO Designation: M 180, shall withstand a cold bend, without cracking, of 180 degrees around a mandrel of a diameter equal to 2.5 times the thickness of the plate.

**In Section 83-1.02B replace the 9th paragraph with:**

The grades and species of wood posts and blocks shall be No. 1 timbers (also known as No. 1 structural) Douglas fir or No. 1 timbers Southern yellow pine. Wood posts and blocks shall be graded in conformance with the provisions in Section 57-2, "Structural Timber," of the Standard Specifications, except allowances for shrinkage after mill cutting shall in no case exceed 5 percent of the American Lumber Standards minimum sizes, at the time of installation.

**In Section 83-1.02B replace the 11th paragraph with:**

After fabrication, wood posts and blocks shall be pressure treated in conformance with Section 58, "Preservative Treatment of Lumber, Timber and Piling," and AWPA Use Category System: UC4A, Commodity Specification A.

**In Section 83-1.02B replace the 12th paragraph with:**

If copper naphthenate, ammoniacal copper arsenate, chromated copper arsenate, ammoniacal copper zinc arsenate, ammoniacal copper quat or copper azole is used to treat the wood posts and blocks, the bolt holes shall be treated as follows:

- A. Before the bolts are inserted, bolt holes shall be filled with a grease, recommended by the manufacturer for corrosion protection, which will not melt or run at a temperature of 65°C.

**In Section 83-1.02B replace the 24th paragraph with:**

End anchor assemblies and rail tensioning assemblies for metal beam guard railing shall be constructed as shown on the plans and shall conform to the following provisions:

1. An end anchor assembly (Type SFT) for metal beam guard railing shall consist of an anchor cable, an anchor plate, a wood post, a steel foundation tube, a steel soil plate and hardware.
2. An end anchor assembly (Type CA) for metal beam guard railing shall consist of an anchor cable, an anchor plate, a single anchor rod or double anchor rods, hardware and one concrete anchor.
3. A rail tensioning assembly for metal beam guard railing shall consist of an anchor cable, an anchor plate, and hardware.
4. The anchor plate, metal plates, steel foundation tubes and steel soil plate shall be fabricated of steel conforming to the requirements in ASTM Designation: A 36/A 36M.
5. The anchor rods shall be fabricated of steel conforming to the requirements in ASTM Designation: A 36/A 36M, A 441 or A 572, or ASTM Designation: A 576, Grades 1018, 1019, 1021 or 1026. The eyes shall be hot forged or formed with full penetration welds. After fabrication, anchor rods with eyes that have been formed with any part of the eye below 870°C during the forming operation or with eyes that have been closed by welding shall be thermally stress relieved prior to galvanizing. The completed anchor rod, after galvanizing, shall develop a strength of 220 kN.
6. In lieu of built-up fabrication of anchor plates as shown on the plans, anchor plates may be press-formed from steel plate, with or without welded seams.
7. All bolts and nuts shall conform to the requirements in ASTM Designation: A 307, unless otherwise specified in the special provisions or shown on the plans.
8. Anchor cable shall be 19 mm preformed, 6 x 19, wire strand core or independent wire rope core (IWRC), galvanized in conformance with the requirements in Federal Specification RR-W-410, right regular lay, manufactured of improved plow steel with a minimum breaking strength of 200 kN. Two certified copies of mill test reports of each manufactured length of cable used shall be furnished to the Engineer. The overall length of each cable anchor assembly shall be as shown on the plans, but shall be a minimum of 2 m.

9. Where shown on the plans, cable clips and a cable thimble shall be used to attach cable to the anchor rod. Thimbles shall be commercial quality, galvanized steel. Cable clips shall be commercial quality drop forged galvanized steel.
10. The swaged fitting shall be machined from hot-rolled bars of steel conforming to AISI Designation: C 1035, and shall be annealed suitable for cold swaging. The swaged fitting shall be galvanized before swaging. A lock pin hole to accommodate a 6 mm, plated, spring steel pin shall be drilled through the head of the swage fitting to retain the stud in proper position. The manufacturer's identifying mark shall be stamped on the body of the swage fitting.
11. The 25 mm nominal diameter stud shall conform to the requirements in ASTM Designation: A 449 after galvanizing. Prior to galvanizing, a 10 mm slot for the locking pin shall be milled in the stud end.
12. The swaged fittings, stud and nut assembly shall develop the specified breaking strength of the cable.
13. The cable assemblies shall be shipped as a complete unit including stud and nut.
14. Clevises shall be drop forged galvanized steel and shall develop the specified breaking strength of the cable.
15. One sample of cable properly fitted with swaged fitting and right hand thread stud at both ends as specified above, including a clevis when shown on the plans, one meter in total length, shall be furnished the Engineer for testing.
16. The portion of the anchor rod to be buried in earth shall be coated with a minimum 0.5 mm thickness of coal tar enamel conforming to AWWA Standard: C203 or a coal tar epoxy conforming to the requirements in Steel Structures Painting Council Paint Specification No. 16, Coal-Tar Epoxy-Polyimide Black Paint or Corps of Engineers Specification, Formula C-200a, Coal-Tar Epoxy Paint.
17. Metal components of the anchor assembly shall be fabricated in conformance with good shop practice and shall be hot-dip galvanized in conformance with the provisions in Section 75-1.05, "Galvanizing."
18. Anchor cables shall be tightened after the concrete anchor has cured for at least 5 days.
19. Concrete used to construct anchors for end anchor assemblies shall be Class 3 or minor concrete conforming to the provisions in Section 90, "Portland Cement Concrete."
20. Concrete shall be placed against undisturbed material of the excavated holes for end anchors. The top 300 mm of holes shall be formed, if required by the Engineer.
21. Reinforcing steel in concrete anchors for end anchor assemblies shall conform to the provisions in Section 52, "Reinforcement."

**In Section 83-1.02D replace the 2nd paragraph with:**

Structural shapes, tubing, plates, bars, bolts, nuts, and washers shall be structural steel conforming to the provisions in Section 55-2, "Materials." Other fittings shall be commercial quality.

**In Section 83-1.02E replace the 2nd paragraph with:**

Pipe for posts and braces shall be standard steel pipe or pipe that conforms to the provisions in Section 80-4.01A, "Posts and Braces."

**In Section 83-1.02E, delete the 3rd paragraph**

**In Section 83-1.02E in the 7th paragraph, replace the 2nd sentence with:**

Cable shall be galvanized in conformance with the requirements in Federal Specification RR-W-410.

**In Section 83-1.02I replace the 5th paragraph with:**

Where shown on the plans, cables used in the frame shall be 8 mm in diameter, wire rope, with a minimum breaking strength of 22 kN and shall be galvanized in conformance with the requirements in Federal Specification RR-W-410.

**In Section 83-1.02I replace the 14th paragraph with:**

Chain link fabric shall be either 11-gage Type I zinc-coated fabric conforming to the requirements in AASHTO M 181 or 11-gage Type IV polyvinyl chloride (PVC) coated fabric conforming to the requirements in Federal Specification RR-F-191/1.

**In Section 83-1.03 replace the 2nd paragraph with:**

Except for metal beam guard railing within the pay limits of a terminal system end treatment or transition railing (Type WB), metal beam guard railing will be measured by the meter along the face of the rail element from end post to end post of the completed railing at each installation. The point of measurement at each end post will be the center of the bolt attaching the rail element to the end post.

**In Section 83-1.03 replace the 7th and 8th paragraphs with:**

The quantities of end anchor assemblies (Type SFT or Type CA) and rail tensioning assemblies will be measured as units determined from actual count. An end anchor assembly (Type CA) with 2 cables attached to one concrete anchor will be counted as one terminal anchor assembly (Type CA) for measurement and payment.

The quantities of return and end caps and the various types of terminal sections for metal beam guard railing will be determined as units from actual count.

**In Section 83-1.04 replace the 3rd and 4th paragraphs with:**

The contract unit prices paid for end anchor assembly (Type SFT), end anchor assembly (Type CA), and rail tensioning assembly shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all work involved in constructing the end anchor assemblies, complete in place, including drilling anchor plate bolt holes in rail elements, driving steel foundation tubes, excavating for concrete anchor holes and disposing of surplus material, as shown on the plans, as specified in these specifications and the special provisions, and as directed by the Engineer.

The contract unit prices paid for return caps, end caps, and the various types of terminal sections for metal beam guard railing shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in installing terminal sections, return and end caps, complete in place, as shown on the plans, as specified in these specifications and the special provisions, and as directed by the Engineer.

**In Section 83-2.02B replace the 2nd paragraph with:**

Rail elements, backup plates, terminal connectors, terminal sections, and return caps shall conform to Class A, Type 1 three beam guard railing as shown in AASHTO Designation: M 180.

**In Section 83-2.02B replace the 14th paragraph with:**

All metal work shall be fabricated in the shop, and no punching, cutting or welding will be permitted in the field. Rail elements shall be lapped so that the exposed ends will not face approaching traffic. Terminal sections and return caps shall be installed in conformance with the manufacturer's recommendation.

**In Section 83-2.02D(2) replace the 1st paragraph with:**

Type 50 and 60 series concrete barriers shall be constructed of minor concrete conforming to the provisions in Section 90-10, "Minor Concrete," except as follows:

- a. The maximum size of aggregate used for extruded or slip-formed concrete barriers shall be at the option of the Contractor, but in no case shall the maximum size be larger than 37.5-mm or smaller than 9.5-mm.
- b. If the 9.5 mm maximum size aggregate grading is used to construct extruded or slip-formed concrete barriers, the cementitious material content of the minor concrete shall be not less than 400 kilograms per cubic meter.

**In Section 83-2.02D(2) replace the 3rd paragraph with:**

The concrete paving between the tops of the 2 walls of concrete barrier (Types 50E, 60E, 60GE, and 60SE) and the optional concrete slab at the base between the 2 walls of concrete barrier (Types 50E, 60E, 60GE, and 60SE) shall be constructed of minor concrete conforming to the provisions of Section 90-10, "Minor Concrete," except that the minor concrete shall contain not less than 300 kilograms of cementitious material per cubic meter.

**In Section 83-2.03 replace the 1st and 2nd paragraphs with:**

Except for single thrie beam barrier within the pay limits of transition railing (Type STB), single thrie beam barrier will be measured by the meter from end post to end post along the face of the rail element of the installed barrier. Single thrie beam barriers constructed on each side of piers under structures or other obstructions will be measured for payment along each line of the installed barrier.

Except for double thrie beam barrier within the pay limits of transition railing (Type DTB), double thrie beam barrier will be measured by the meter from end post to end post along the center line of the installed barrier.

**In Section 83-2.03 replace the 5th and 6th paragraphs with:**

The quantity of return caps, terminal connectors and the various types of terminal sections for single and double thrie beam barriers will be determined as units from actual count.

The quantity of end anchor assemblies will be paid for as units determined from actual count.

**In Section 83-2.04 replace the 1st and 2nd paragraphs with:**

The various types of thrie beam barrier, measured as specified in Section 83-2.03, "Measurement," will be paid for at the contract price per meter for single or double thrie beam barrier, whichever applies, and the contract unit price or prices for end anchor assemblies, return caps, terminal connectors and the various types of terminal sections.

The above prices and payments shall include full compensation for furnishing all labor, materials, tools, equipment and incidentals, and for doing all the work involved in constructing the barrier, complete in place, including drilling holes for wood posts, driving posts, backfilling the space around posts, excavating and backfilling end anchor assembly holes, connecting thrie beam barrier to concrete surfaces and disposing of surplus excavated material, and for furnishing, placing, removing and disposing of the temporary railing for closing the gap between existing barrier and the barrier being constructed as shown on the plans, and as specified in these specifications and the special provisions, and as directed by the Engineer.

**In Section 83-2.04 replace the 4th paragraph with:**

Steel plate barrier attached to concrete barrier at overhead sign foundations, electroliers, drainage structures, and other locations shown on the plans will be measured and paid for as the type of concrete barrier attached thereto.

^^

**SECTION 84 TRAFFIC STRIPES AND PAVEMENT MARKINGS**

**(Issued 07-21-06)**

**In Section 84-2.02 replace the 1st paragraph with:**

The thermoplastic material shall conform to State Specification PTH-02SPRAY, PTH-02HYDRO or PTH-02ALKYD. Glass beads to be applied to the surface of the molten thermoplastic material shall conform to the requirements of State Specification 8010-004 (Type II).

**In Section 84-3.02 replace the 1st paragraph with:**

Paint for traffic stripes and pavement markings shall conform to the following State Specifications:





**Replace Section 85-1.04 with:**

**85-1.04 NON-REFLECTIVE PAVEMENT MARKERS**

Non-reflective pavement markers (Types A and AY) shall be, at the option of the Contractor, either ceramic or plastic conforming to these specifications.

The top surface of the marker shall be convex with a gradual change in curvature. The top, bottom and sides shall be free of objectionable marks or discoloration that will affect adhesion or appearance.

The bottom of markers shall have areas of integrally formed protrusions or indentations, which will increase the effective bonding surface area of adhesive. The bottom surface of the marker shall not deviate more than 1.5 mm from a flat surface. The areas of protrusion shall have faces parallel to the bottom of the marker and shall project approximately one mm from the bottom.

**In Section 85-1.04A, delete the 2nd through 4th paragraphs.**

**In Section 85-1.04A replace the 5th paragraph with:**

**Testing**

Tests shall be performed in conformance with the requirements in California Test 669.

Test	Test Description	Requirement
a	Bond strength	4.8 MPa, min.
b	Glaze thickness	180 µm, min.
c	Hardness	6 Moh, min.
d	Luminance factor, Type A, white markers only, glazed surface	75, min.
e	Yellowness index, Type A, white markers only, glazed surface	7, max.
f	Color-yellow, Type AY, yellow markers only. The chromaticity coordinates shall be within a color box defined in CTM 669	Pass
g	Compressive strength	6700 N, min.
h	Water absorption	2.0 %, max.
i	Artificial weathering, 500 hours exposure, yellowness index	20, max.

**Replace Section 85-1.04B with:**

**85-1.04B Non-Reflective Pavement Markers (Plastic)**

Plastic non-reflective pavement markers Types A and AY shall be, at the option of the Contractor, either polypropylene or acrylonitrile-butadiene-styrene (ABS) plastic type.

Plastic markers shall conform to the testing requirements specified in Section 85-1.04A, "Non-Reflective Pavement Markers (Ceramic)," except that Tests a, b, c, and h shall not apply. The plastic markers shall not be coated with substances that interfere with the ability of the adhesive bonding to the marker.

**In Section 85-1.05 replace the 6th and 7th paragraphs with:**

**Testing**

Tests shall be performed in conformance with the requirements in California Test 669.



**In Section 86-1.02 delete the 2nd paragraph.**

**In Section 86-1.06 replace the 10th paragraph with:**

These provisions will not relieve the Contractor in any manner of the Contractor's responsibilities as provided in Section 7-1.12, "Indemnification and Insurance," and Section 7-1.16, "Contractor's Responsibility for the Work and Materials."

**In Section 86-2.02 in the 1st paragraph, replace the 1st sentence with:**

Improvements such as sidewalks, curbs, gutters, portland cement concrete and hot mix asphalt pavement, underlying material, lawns and plants and any other improvements removed, broken or damaged by the Contractor's operations, shall be replaced or reconstructed with the same kind of material as found on the work or with materials of equal quality.

**In Section 86-2.03 replace the 1st paragraph with:**

Except for concrete for cast-in-drilled-hole concrete pile foundations, portland cement concrete shall conform to Section 90-10, "Minor Concrete."

**In Section 86-2.03 replace the 3rd, 4th, and 5th paragraph with:**

Except when located on structures, foundations for posts, standards, and pedestals shall be placed "in the solid" and monolithic.

After each post, standard, and pedestal is in proper position, mortar shall be placed under the base plate as shown on the plans. The exposed portions shall be finished to present a neat appearance. Mortar shall conform to Section 51-1.135, "Mortar," except the mortar shall consist of one part by volume of cementitious material and 3 parts of clean sand.

Reinforced cast-in-drilled-hole concrete pile foundations shall conform to the provisions in Section 49, "Piling," with the following exceptions:

- A. Material resulting from drilling holes shall be disposed of in conformance with the provisions in Section 86-2.01, "Excavating and Backfilling,"
- B. Concrete for cast-in-drilled-hole concrete piles will not be considered as designated by compressive strength.

**In Section 86-2.03 replace the 7th paragraph with:**

Forms shall be true to line and grade. Tops of foundations for posts and standards, except special foundations, shall be finished to curb or sidewalk grade or as directed by the Engineer. Forms shall be rigid and securely braced in place. Conduit ends and anchor bolts shall be placed in proper position and to proper height, and anchor bolts shall be held in place by means of rigid top and bottom templates. The bottom template shall be made of steel. The bottom template shall provide proper spacing and alignment of the anchor bolts near their bottom embedded end. The bottom template shall be installed before placing footing concrete. Anchor bolts shall not be installed more than 1:40 from vertical.

**In Section 86-2.03, delete the 8th paragraph.**

**In Section 86-2.03 replace the 12th paragraph with:**

Plumbing of the standards shall be accomplished by adjusting the leveling nuts before placing the mortar or before the foundation is finished to final grade. Shims or other similar devices shall not be used for plumbing or raking of posts, standards, or pedestals. After final adjustments of both top nuts and leveling nuts on anchorage assemblies have been made, firm contact shall exist between all bearing surfaces of the anchor bolt nuts, washers, and the base plates.

**In Section 86-2.04 replace the 1st and 2nd paragraphs with:**

Bolts, nuts and washers, and anchor bolts for use in signal and lighting support structures shall conform to the provisions in Section 55-2, "Materials." Except when bearing-type connections or slipbases are specified, high-strength bolted connections shall conform to the provisions in Section 55-3.14, "Bolted Connections." Welding, nondestructive testing (NDT) of welds, and acceptance and repair criteria for NDT of steel members shall conform to the requirements of AWS D1.1 and the special provisions.

On each lighting standard except Type 1, one rectangular corrosion resistant metal identification tag shall be permanently attached above the hand hole, near the base of the standard, using stainless steel rivets. On each signal pole support, two corrosion resistant metal identification tags shall be attached, one above the hand hole near the base of the vertical standard and one on the underside of the signal mast arm near the arm plate. As a minimum, the information on each identification tag shall include the name of the manufacturer, the date of manufacture, the identification number as shown on the plans, the contract number, and a unique identification code assigned by the fabricator. This number shall be traceable to a particular contract and the welds on that component, and shall be readable after the support structure is coated and installed. The lettering shall be a minimum of 7 mm high. The information may be either depressed or raised, and shall be legible.

**In Section 86-2.04 replace the 4th paragraph with:**

Ferrous metal parts of standards, with shaft length of 4.6 m and longer, shall conform to the details shown on the plans, the provisions in Section 55-2, "Materials," except as otherwise noted, and the following requirements:

- A. Except as otherwise specified, standards shall be fabricated from sheet steel of weldable grade having a minimum yield strength, after fabrication, of 276 MPa.
- B. Certified test reports which verify conformance to the minimum yield strength requirements shall be submitted to the Engineer. The test reports may be the mill test reports for the as-received steel or, when the as-received steel has a lower yield strength than required, the Contractor shall provide supportive test data which provides assurance that the Contractor's method of cold forming will consistently increase the tensile properties of the steel to meet the specified minimum yield strength. The supportive test data shall include tensile properties of the steel after cold forming for specific heats and thicknesses.
- C. When a single-ply 8-mm thick pole is specified, a 2-ply pole with equivalent section modulus may be substituted.
- D. Standards may be fabricated of full-length sheets or shorter sections. Each section shall be fabricated from not more than 2 pieces of sheet steel. Where 2 pieces are used, the longitudinal welded seams shall be directly opposite one another. When the sections are butt-welded together, the longitudinal welded seams on adjacent sections shall be placed to form continuous straight seams from base to top of standard.
- E. Butt-welded circumferential joints of tubular sections requiring CJP groove welds shall be made using a metal sleeve backing ring inside each joint. The sleeve shall be 3-mm nominal thickness, or thicker, and manufactured from steel having the same chemical composition as the steel in the tubular sections to be joined. When the sections to be joined have different specified minimum yield strengths, the steel in the sleeve shall have the same chemical composition as the tubular section having the higher minimum yield strength. The width of the metal sleeve shall be consistent with the type of NDT chosen and shall be a minimum width of 25 mm. The sleeve shall be centered at the joint and be in contact with the tubular section at the point of the weld at time of fit-up.
- F. Welds shall be continuous.
- G. The weld metal at the transverse joint shall extend to the sleeve, making the sleeve an integral part of the joint.
- H. During fabrication, longitudinal seams on vertical tubular members of cantilevered support structures shall be centered on and along the side of the pole that the pole plate is located. Longitudinal seams on horizontal tubular members, including signal and luminaire arms, shall be within +/-45 degrees of the bottom of the arm.
- I. The longitudinal seam welds in steel tubular sections may be made by the electric resistance welding process.
- J. Longitudinal seam welds shall have 60 percent minimum penetration, except that within 150 mm of circumferential welds, longitudinal seam welds shall be CJP groove welds. In addition, longitudinal seam welds on lighting support structures having telescopic pole segment splices shall be CJP groove welds on the female end for a length on each end equal to the designated slip fit splice length plus 150 mm.
- K. Exposed circumferential welds, except fillet and fatigue-resistant welds, shall be ground flush (-0, +2 mm) with the base metal prior to galvanizing or painting.

- L. Circumferential welds and base plate-to-pole welds may be repaired only one time without written permission from the Engineer.
- M. Exposed edges of the plates that make up the base assembly shall be finished smooth and exposed corners of the plates shall be broken unless otherwise shown on the plans. Shafts shall be provided with slip-fitter shaft caps.
- N. Flatness of surfaces of 1) base plates that are to come in contact with concrete, grout, or washers and leveling nuts; 2) plates in high-strength bolted connections; 3) plates in joints where cap screws are used to secure luminaire and signal arms; and 4) plates used for breakaway slip base assemblies shall conform to the requirements in ASTM A6.
- O. Standards shall be straight, with a permissive variation not to exceed 25 mm measured at the midpoint of a 9-m or 11-m standard and not to exceed 20 mm measured at the midpoint of a 5-m through 6-m standard. Variation shall not exceed 25 mm at a point 4.5 m above the base plate for Type 35 and Type 36 standards.
- P. Zinc-coated nuts used on fastener assemblies having a specified preload (obtained by specifying a prescribed tension, torque value, or degree of turn) shall be provided with a colored lubricant that is clean and dry to the touch. The color of the lubricant shall be in contrast to the zinc coating on the nut so that the presence of the lubricant is visually obvious. In addition, either the lubricant shall be insoluble in water, or fastener components shall be shipped to the job site in a sealed container.
- Q. No holes shall be made in structural members unless the holes are shown on the plans or are approved in writing by the Engineer.
- R. Standards with an outside diameter of 300 mm or less shall be round. Standards with an outside diameter greater than 300 mm shall be round or multisided. Multisided standards shall have a minimum of 12 sides which shall be convex and shall have a minimum bend radius of 100 mm.
- S. Mast arms for standards shall be fabricated from material as specified for standards, and shall conform to the dimensions shown on the plans.
- T. The cast steel option for slip bases shall be fabricated from material conforming to the requirements in ASTM Designation: A 27/A 27M, Grade 70-40. Other comparable material may be used if written permission is given by the Engineer. The casting tolerances shall be in conformance with the Steel Founder's Society of America recommendations (green sand molding).
- U. One casting from each lot of 50 castings or less shall be subject to radiographic inspection, in conformance with the requirements in ASTM Designation: E 94. The castings shall comply with the acceptance criteria severity level 3 or better for the types and categories of discontinuities in conformance with the requirements in ASTM Designations: E 186 and E 446. If the one casting fails to pass the inspection, 2 additional castings shall be radiographed. Both of these castings shall pass the inspection, or the entire lot of 50 will be rejected.
- V. Material certifications, consisting of physical and chemical properties, and radiographic films of the castings shall be filed at the manufacturer's office. These certifications and films shall be available for inspection upon request.
- W. High-strength bolts, nuts, and flat washers used to connect slip base plates shall conform to the requirements in ASTM Designation: A 325 or A 325M and shall be galvanized in conformance with the provisions in Section 75-1.05, "Galvanizing."
- X. Plate washers shall be fabricated by saw cutting and drilling steel plate conforming to the requirements in AISI Designation: 1018, and be galvanized in conformance with the provisions in Section 75-1.05, "Galvanizing." Prior to galvanizing, burrs and sharp edges shall be removed and holes shall be chamfered sufficiently on each side to allow the bolt head to make full contact with the washer without tension on the bolt.
- Y. High-strength cap screws shown on the plans for attaching arms to standards shall conform to the requirements in ASTM Designation: A 325, A 325M, or A 449, and shall comply with the mechanical requirements in ASTM Designation: A 325 or A 325M after galvanizing. The cap screws shall be galvanized in conformance with the provisions in Section 75-1.05, "Galvanizing." The threads of the cap screws shall be coated with a colored lubricant that is clean and dry to the touch. The color of the lubricant shall be in contrast to the color of the zinc coating on the cap screw so that presence of the lubricant is visually obvious. In addition, either the lubricant shall be insoluble in water, or fastener components shall be shipped to the job site in a sealed container.
- Z. Unless otherwise specified, bolted connections attaching signal or luminaire arms to poles shall be considered slip critical. Galvanized faying surfaces on plates on luminaire and signal arms and matching plate surfaces on poles shall be roughened by hand using a wire brush prior to assembly and shall conform to the requirements for Class C surface conditions for slip-critical connections in "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts," a specification approved by the Research Council on Structural Connections (RCSC) of the Engineering Foundation. For faying surfaces required to be painted,

- the paint shall be an approved type, brand, and thickness that has been tested and approved according to the RCSC Specification as a Class B coating.
- AA. Samples of fastener components will be randomly taken from each production lot by the Engineer and submitted, along with test reports required by appropriate ASTM fastener specifications, for QA testing and evaluation. Sample sizes for each fastener component shall be as determined by the Engineer.

**In Section 86-2.04 replace the 7th paragraph with:**

To avoid interference of arm plate-to-tube welds with cap screw heads, and to ensure cap screw heads can be turned using conventional installation tools, fabricators shall make necessary adjustments to details prior to fabrication and properly locate the position of arm tubes on arm plates during fabrication.

**In Section 86-2.05C in the 18th paragraph, replace the 4th and 5th subparagraphs with:**

The conduit shall be placed in the bottom of the trench, and the trench shall be backfilled with minor concrete conforming to the provisions in Section 90-10, "Minor Concrete." Minor concrete shall contain not less than 350 kilograms of cementitious material per cubic meter. Concrete backfill shall be placed to the pavement surface except, when the trench is in hot mix asphalt pavement and additional pavement is not being placed, the top 30 mm of the trench shall be backfilled with hot mix asphalt produced from commercial quality paving asphalt and aggregates.

Prior to spreading hot mix asphalt, tack coat shall be applied in conformance with the provisions in Section 39, "Hot Mix Asphalt." Spreading and compacting of hot mix asphalt shall be performed by any method which will produce a hot mix asphalt surfacing of uniform smoothness, texture and density.

**In Section 86-2.05C in the 23rd paragraph, replace the 3rd subparagraph with:**

Precast concrete conduit cradles shall conform to the dimensions shown on the plans and shall be constructed of minor concrete and commercial quality welded wire fabric. Minor concrete shall conform to the provisions in Section 90-10, "Minor Concrete," and shall contain not less than 350 kilograms of cementitious material per cubic meter. The cradles shall be moist cured for not less than 3 days.

**In Section 86-2.05C in the 23rd paragraph, replace the 7th subparagraph with:**

The space around conduits through bridge abutment walls shall be filled with mortar conforming to the provisions in Section 51-1.135, "Mortar," except that the proportion of cementitious material to sand shall be 1:3.

**In Section 86-2.07 replace the 5th paragraph with:**

Concrete placed around and under traffic pull boxes as shown on the plans shall be minor concrete conforming to the provisions in Section 90-10, "Minor Concrete."

**In Section 86-2.08A in the 1st paragraph in the table, after the heading replace the 4th row with:**

Traffic Signal Controller Cabinet	Ungrounded Circuit Conductor	Blk	None	CON-1	6
	Grounded Circuit Conductor	Wht	None	CON-2	6

**In Section 86-2.08B replace the 2nd paragraph with:**

At any point, the minimum insulation thickness of any Type USE, RHH, or RHW insulation shall be 1.0 mm for conductor sizes No. 14 to No. 10, inclusive; and 1.3 mm for No. 8 to No. 2, inclusive.

At any point, the minimum insulation thickness of any Type THW or TW wires shall be 0.7 mm for conductor sizes No. 14 to No. 10, inclusive; 1.0 mm for No. 8; and 1.4 mm for No. 6 to No. 2, inclusive.

**In Section 86-2.12 replace the 6 and 7th paragraphs with:**

After fabrication, wood poles shall be pressure treated in conformance with the provisions in Section 58, "Preservative Treatment of Lumber, Timber and Piling," and AWPA Use Category System: UC4B, Commodity Specification D.

Wood poles, when specified in the special provisions to be painted, shall be treated with waterborne wood preservatives.

**In Section 86-2.15 replace the 1st paragraph with:**

Galvanizing shall be in conformance with the provisions in Section 75-1.05, "Galvanizing," except that cabinets may be constructed of material galvanized prior to fabrication in conformance with the requirements in ASTM Designation: A 653/653M, Coating Designation G 90, in which case all cut or damaged edges shall be painted with at least 2 applications of approved unthinned zinc-rich primer (organic vehicle type) conforming to the provisions in Section 91, "Paint." Aerosol cans shall not be used. Other types of protective coating must be approved by the Engineer prior to installation.

**In Section 86-2.16, in the 13th paragraph, replace item B with:**

- B. Salt Spray Resistance - The undercutting of the film of the coating system shall not exceed 3 mm average, from lines scored diagonally and deep enough to expose the base metal, after 336 hours exposure in a salt spray cabinet in conformance with the requirements in ASTM Designation: B 117.

**In Section 86-4.01 replace the 1st paragraph with:**

Each vehicle signal face shall be of the adjustable type conforming to the requirements in Institute of Transportation Engineers (ITE) Publication: ST-017B, "Vehicle Traffic Control Signal Heads."

**In Section 86-4.01A in the 1st paragraph, replace the 1st and 3rd subparagraphs with:**

Lenses, reflectors, reflector assemblies, lamp receptacles, lamps, wiring and light distribution shall conform to the requirements in ITE Publication: ST-017B.

All reflectors shall conform to the requirements in ITE Publication: ST-017B except that reflectors shall be made of silvered glass or of specular aluminum with an anodic coating. Reflector ring holder shall be made of cast aluminum.

**In Section 86-4.01B replace the 1st paragraph with:**

Each signal section housing shall be either die-cast or permanent mold-cast aluminum conforming to ITE Publication: ST-017B or, when specified in the special provisions, shall be structural plastic.

**In Section 86-4.01C replace the 1st paragraph with:**

Lamp receptacles and wiring shall conform to ITE Publication: ST-017B. The metal portion of the medium base lamp socket shall be brass, copper or phosphor bronze.

**In Section 86-4.01D replace the 1st paragraph with:**

Each signal section shall be provided with a removable visor conforming to the requirements in ITE Publication: ST-017B. Visors are classified, on the basis of lens enclosure, as full circle, tunnel (bottom open), or cap (bottom and lower sides open). Unless otherwise specified, visors shall be the tunnel type.

**In Section 86-4.02A replace the 1st paragraph with:**

Light emitting diode signal modules shall be designed as retrofit replacements for optical units of standard traffic signal sections and shall not require special tools for installation. Light emitting diode signal modules shall fit into existing traffic signal section housings built in conformance with the requirements in the Institute of Transportation Engineers (ITE) publication ST-017B, "Vehicle Traffic Control Signal Heads (VTC SH)" without modification to the housing.

**In Section 86-4.02A replace the 7th paragraph with:**

Light emitting diode signal modules shall be protected against dust and moisture intrusion in conformance with the requirements in NEMA Standard 250 for Type 4 enclosures to protect the internal components.



**In Section 86-4.02B replace the 1st paragraph with:**

The minimum initial luminous intensity values for light emitting diode signal modules shall conform to the requirements in Section 11.04 of the Institute of Transportation Engineers (ITE) publication ST-017B, "Vehicle Traffic Control Signal Heads (VTC SH)" at 25°C.

**In Section 86-4.02C replace the 3rd paragraph with:**

The light emitting diode signal module on-board circuitry shall include voltage surge protection to withstand high-repetition noise transients as specified in Section 2.1.6 of NEMA Standard TS2.

**In Section 86-4.02D(1), in the 4th paragraph, replace the 7th subparagraph with:**

Moisture resistance testing shall be performed on light emitting diode signal modules in conformance with the requirements in NEMA Standard 250 for Type 4 enclosures. Evidence of internal moisture after testing shall be cause for rejection.

**In Section 86-4.05 replace the 2nd paragraph with:**

Each programmed visibility signal section shall provide a nominal 300-mm diameter circular or arrow indication. Color and arrow configuration shall conform to the requirements in ITE Publication: ST-017B.

**In Section 86-4.06 replace the 1st paragraph with:**

Message symbols for pedestrian signal faces shall be white WALKING PERSON and Portland orange UPRAISED HAND conforming to the requirements in the Institute of Transportation Engineers Standards: "Pedestrian Traffic Control Signal Indications" and "California MUTCD." The height of each symbol shall be not less than 250 mm and the width of each symbol shall be not less than 165 mm.

**In Section 86-4.06(A) in the 1st paragraph, replace the 3rd subparagraph with:**

Each reflector assembly shall consist of a double reflector or 2 single reflectors. Each reflector shall be made of either aluminum or plastic. Reflectors shall conform to the requirements in Institute of Transportation Engineers Publication: ST-017B, "Vehicle Traffic Control Signal Heads." Plastic reflectors shall consist of molded or vacuum-formed plastic with a vacuum-deposited aluminum reflecting surface. The plastic material shall not distort when the reflector is used with the lamp of the wattage normally furnished with the signal. In addition, the UL nonmechanical loading temperature of the material shall exceed, by at least 10°C, the maximum temperature in the signal section with the lamp "ON" and measured in an ambient air temperature of 25°C in conformance with the requirements in UL Publication UL 746B. Each completed reflector shall, when operated with the appropriate lamp and lens, provide the message brightness specified.

**In Section 86-4.07 replace the 10th paragraph with:**

The luminance of the "UPRAISED HAND" symbol shall be 3750 cd/m<sup>2</sup> minimum. The color of "UPRAISED HAND" shall be Portland orange conforming to the requirements of the Institute of Transportation Engineers Standards: "Pedestrian Traffic Control Signal Indications" and "California MUTCD." The height of each symbol shall be not less than 250 mm and the width of each symbol shall be not less than 165 mm.

**In Section 86-4.07C replace the 2nd paragraph with:**

On-board circuitry of the light emitting diode pedestrian signal modules shall include voltage surge protection to withstand high-repetition noise transients as stated in Section 2.1.6 of NEMA Standard TS2.

**In Section 86-4.07D(1) replace the 2nd paragraph with:**

A quantity of 2 units for each design shall be submitted for Design Qualification Testing. Test units shall be submitted to the Transportation Laboratory, after manufacturer's testing is complete.

**In Section 86-4.07D(1) in the 4th paragraph, replace the 5th and 7th subparagraphs with:**

Mechanical vibration testing shall be in conformance with the requirements in Military Specification MIL-STD-883, Test Method 2007, using three 4-minute cycles along each x, y and z axis, at a force of 2.5 Gs, with a frequency sweep from 2 Hz to 120 Hz. The loosening of the lens or of internal components, or other physical damage shall be cause for rejection.

Moisture resistance testing shall be performed on modules mounted in a standard pedestrian signal housing in conformance to the requirements in NEMA Standard 250 for Type 4 enclosures. Evidence of internal moisture after testing shall be cause for rejection.

**In Section 86-5.07A(5) in Section "Elastomeric Sealant" in the 1st paragraph, replace the 2nd sentence with:**

Sealant shall be suitable for use in both hot mix asphalt and portland cement concrete.

**In Section 86-5.07A(5) in Section "Asphatic Emulsion Sealant" in the 1st paragraph, replace the 1st sentence with:**

Asphaltic emulsion sealant shall conform to the requirements in State Specification 8040-41A-15 and shall be used only for filling slots in hot mix asphalt pavement.

**In Section 86-5.07A(5) in Section "Hot-Melt Rubberized Asphalt Sealant" in the 1st paragraph, replace the 3rd sentence with:**

Sealant shall be suitable for use in both hot mix asphalt and portland cement concrete.

**In Section 86-5.07A(5) in Section "Hot-Melt Rubberized Asphalt Sealant" in the 2nd paragraph in the table, after the heading replace rows 1 through 3 with:**

Cone Penetration, 25°C, 150 g, 5 s	D 5329, Sec. 6	3.5 mm, max.
Flow, 60°C	D 5329, Sec. 8	5 mm, max.
Resilience, 25°C	D 5329, Sec. 12	25%, min.

**In Section 86-5.07A(5) in Section "Hot-Melt Rubberized Asphalt Sealant", replace the 10th paragraph with:**

If hot mix asphalt surfacing is to be placed, the loop conductors shall be installed prior to placing the uppermost layer of hot mix asphalt. The conductors shall be installed, as shown on the plans, in the compacted layer of hot mix asphalt immediately below the uppermost layer. Installation details shall be as shown on the plans, except the sealant shall fill the slot flush to the surface.

**In Section 86-5.01D replace the 1st paragraph with:**

When a foundation for a pressure-sensitive vehicle detector is to be removed, the hole left by removing the detector frame and foundation shall be filled with minor concrete, except the roadway surface shall be reconstructed with material to match existing surfacing. Minor concrete shall conform to the provisions in Section 90-10, "Minor Concrete," except that the concrete shall contain not less than 250 kilograms of cementitious material per cubic meter for hot mix asphalt surfaced roadways and not less than 350 kilograms of cementitious material per cubic meter for portland cement concrete surfaced roadways.

**In Section 86-6.065 in Section "Mounting Assemblies", replace the 3rd paragraph with:**

At least 4.9 m of clearance shall be provided between the bottom of the fixture and the roadway.

The contract lump sum price or prices paid for signal, ramp metering, flashing beacon, lighting, sign illumination, traffic monitoring station, highway advisory radio systems, closed circuit television systems, or combinations thereof; for modifying or removing those systems; for temporary systems; or the lump sum or unit prices paid for various units of those systems; or the lump sum or per meter price paid for conduit of the various sizes, types and installation methods listed in the Engineer's Estimate shall include full compensation for furnishing all labor, materials, tools, equipment and incidentals, and for doing all the work involved in furnishing and installing, modifying, or removing the systems, combinations or units thereof, as shown on the plans, as specified in these specifications and the special provisions, and as directed by the Engineer, including any necessary pull boxes (except when the type required is shown as a separate contract item); excavation and backfill; concrete foundations (except when shown as a separate contract item); pedestrian barricades; furnishing and installing illuminated street name signs; installing sign panels on pedestrian barricades, on flashing beacon standards, and on traffic signal mast arms; restoring sidewalk, pavement and appurtenances damaged or destroyed during construction; salvaging existing materials; and making all required tests.

If a portion or all of the poles for signal, lighting and electrical systems pursuant to Standard Specification Section 86, "Signals, Lighting and Electrical Systems," is fabricated more than 480 air line kilometers from both Sacramento and Los Angeles, additional shop inspection expenses will be sustained by the State. Whereas it is and will be impracticable and extremely difficult to ascertain and determine the actual increase in such expenses, it is agreed that payment to the Contractor for furnishing such items from each fabrication site located more than 480 air line kilometers from both Sacramento and Los Angeles will be reduced \$5000; in addition, in the case where a fabrication site is located more than 4800 air line kilometers from both Sacramento and Los Angeles, payment will be reduced an additional \$3000 per each fabrication site (\$8000 total per site).

**SECTION 88 ENGINEERING FABRIC**  
**(Issued 01-15-02)**

Pavement reinforcing fabric shall be 100 percent polypropylene staple fiber fabric material, needle-punched, thermally bonded on one side, and conform to the following:

Note: Weight, grab, elongation and asphalt retention are based on Minimum Average Roll Value (MARV)

Contract No. 04-0120T4  
187 of 220

## SECTION 90 PORTLAND CEMENT CONCRETE

(Issued 03-16-07)

Replace Section 90 with:

## SECTION 90 PORTLAND CEMENT CONCRETE

### 90-1 GENERAL

#### 90-1.01 DESCRIPTION

Portland cement concrete shall be composed of cementitious material, fine aggregate, coarse aggregate, admixtures if used, and water, proportioned and mixed as specified in these specifications.

The Contractor shall determine the mix proportions for concrete in conformance with these specifications.

Class 1 concrete shall contain not less than 400 kg of cementitious material per cubic meter.

Class 2 concrete shall contain not less than 350 kg of cementitious material per cubic meter.

Class 3 concrete shall contain not less than 300 kg of cementitious material per cubic meter.

Class 4 concrete shall contain not less than 250 kg of cementitious material per cubic meter.

Minor concrete shall contain not less than 325 kg of cementitious material per cubic meter unless otherwise specified in these specifications or the special provisions.

Unless otherwise designated on the plans or specified in these specifications or the special provisions, the amount of cementitious material used per cubic meter of concrete in structures or portions of structures shall conform to the following:

Use	Cementitious Material Content (kg/m <sup>3</sup> )
Concrete designated by compressive strength:	
Deck slabs and slab spans of bridges	400 min., 475 max.
Roof sections of exposed top box culverts	400 min., 475 max.
Other portions of structures	350 min., 475 max.
Concrete not designated by compressive strength:	
Deck slabs and slab spans of bridges	400 min.
Roof sections of exposed top box culverts	400 min.
Prestressed members	400 min.
Seal courses	400 min.
Other portions of structures	350 min.
Concrete for precast members	350 min., 550 max.

Whenever the 28-day compressive strength shown on the plans is greater than 25 MPa, the concrete shall be designated by compressive strength. If the plans show a 28-day compressive strength that is 28 MPa or greater, an additional 14 days will be allowed to obtain the specified strength. The 28-day compressive strengths shown on the plans that are 25 MPa or less are shown for design information only and are not a requirement for acceptance of the concrete.

Concrete designated by compressive strength shall be proportioned such that the concrete will attain the strength shown on the plans or specified in the special provisions.

Before using concrete for which the mix proportions have been determined by the Contractor, or in advance of revising those mix proportions, the Contractor shall submit in writing to the Engineer a copy of the mix design.

Compliance with cementitious material content requirements will be verified in conformance with procedures described in California Test 518 for cement content. For testing purposes, supplementary cementitious material shall be considered to be cement. Batch proportions shall be adjusted as necessary to produce concrete having the specified cementitious material content.

If any concrete has a cementitious material, portland cement, or supplementary cementitious material content that is less than the minimum required, the concrete shall be removed. However, if the Engineer determines that the concrete is structurally adequate, the concrete may remain in place and the Contractor shall pay to the State \$0.55 for each kilogram of cementitious material, portland cement, or supplementary cementitious material that is less than the minimum required. The Department may deduct the amount from any moneys due, or that may become due, the Contractor under the contract. The deductions will not be made unless the difference between the contents required and those actually provided exceeds the batching tolerances permitted by Section 90-5, "Proportioning." No deductions will be made based on the results of California Test 518.

The requirements of the preceding paragraph shall not apply to minor concrete or commercial quality concrete.

## **90-2 MATERIALS**

### **90-2.01 CEMENTITIOUS MATERIALS**

Unless otherwise specified, cementitious material shall be either a combination of Type II or Type V portland cement and a supplementary cementitious material, or a blended cement.

Cementitious materials used in cast-in-place concrete for exposed surfaces of like elements of a structure shall be from the same sources and of the same proportions.

Cementitious materials shall be protected from moisture until used. Sacked cementitious materials shall be piled to permit access for tallying, inspecting, and identifying each shipment.

Facilities shall be provided to ensure that cementitious materials meeting this Section 90-2.01 are kept separate from other cementitious materials. Sampling cementitious materials shall be in conformance with California Test 125.

The Contractor shall furnish a Certificate of Compliance for cementitious materials in conformance with the provisions in Section 6-1.07, "Certificates of Compliance." The Certificate of Compliance shall indicate the source by name and location (including country, state, and city). If cementitious material is delivered directly to the job site, the Certificate of Compliance shall be signed by the cementitious material supplier. If the cementitious material is used in ready-mixed concrete or in precast concrete products purchased as such by the Contractor, the Certificate of Compliance shall be signed by the manufacturer of the concrete or product.

#### **90-2.01A CEMENT**

Portland cement shall conform to the requirements in ASTM Designation: C 150 except, using a 10-sample moving average, limestone shall not exceed 2.5 percent. The  $C_3S$  content of Type II cement shall not exceed 65 percent.

Blended cement shall conform to the requirements for Portland Blast-Furnace Slag, Cement Type IS (MS) or Portland-Pozzolan Cement, Type IP (MS) in AASHTO Designation: M 240 and shall be comprised of an intimate and uniform blend of Type II or Type V cement and supplementary cementitious material in an amount conforming to the requirements in Section 90-2.01C, "Required Use of Supplementary Cementitious Materials."

In addition, blended cement, Type II portland cement, and Type V portland cement shall conform to the following requirements:

- A. The cement shall not contain more than 0.60-percent by mass of alkalis, calculated as the percentage of  $Na_2O$  plus 0.658 times the percentage of  $K_2O$ , when determined by methods as required in AASHTO Designation: T 105;
- B. The autoclave expansion shall not exceed 0.50-percent; and
- C. Mortar, containing the cement to be used and Ottawa sand, when tested in conformance with California Test 527, shall not expand in water more than 0.010-percent and shall not contract in air more than 0.048-percent, except that when cement is to be used for precast prestressed concrete piling, precast prestressed concrete members, or steam cured concrete products, the mortar shall not contract in air more than 0.053-percent.

Type III portland cement shall be used only as specified in the special provisions or with the approval of the Engineer. Type III portland cement shall conform to the additional requirements listed above for Type II portland cement, except when tested in conformance with California Test 527, mortar containing Type III portland cement shall not contract in air more than 0.075-percent.

#### **90-2.01B SUPPLEMENTARY CEMENTITIOUS MATERIALS (SCM)**

Fly ash shall conform to the requirements in AASHTO Designation: M 295, Class F, and the following:

- A. Calcium oxide content shall not exceed 10 percent.
- B. The available alkali, as sodium oxide equivalent, shall not exceed 1.5 percent when determined in conformance with the requirements in ASTM Designation: C 311 or the total alkali, as sodium oxide equivalent, shall not exceed 5.0 percent when determined in conformance with the requirements in AASHTO Designation: T 105.
- C. Commingling of fly ash from different sources at uncontrolled ratios is permissible only if the following criteria are satisfied:
  - 1. Sources of fly ash to be commingled shall be on the approved list of materials for use in concrete.
  - 2. Testing of the commingled product is the responsibility of the fly ash supplier.

3. Each fly ash's running average of density shall not differ from any other by more than 0.25g/cm<sup>3</sup> at the time of commingling.
4. Each fly ash's running average of loss on ignition shall not differ from any other by more than one percent at the time of commingling.
5. The final product of commingled fly ash shall conform to the requirement in AASHTO Designation: M 295.

Raw or calcined natural pozzolans shall conform to the requirements in AASHTO Designation: M 295, Class N and the following requirements:

- A. Calcium oxide content shall not exceed 10 percent.
- B. The available alkali, as sodium oxide equivalent, shall not exceed 1.5 percent when determined in conformance with the requirements in ASTM Designation: C 311 or the total alkali, as sodium oxide equivalent, shall not exceed 5.0 percent when determined in conformance with the requirements in AASHTO Designation: T 105.

Ground Granulated Blast Furnace Slag (GGBFS) shall conform to the requirements in AASHTO Designation: M 302, Grade 100 or Grade 120.

Silica Fume shall conform to the requirements of AASHTO Designation: M 307 with reduction in mortar expansion of 80 percent, minimum, using the cement from the proposed mix design.

#### **90-2.01C REQUIRED USE OF SUPPLEMENTARY CEMENTITIOUS MATERIALS**

The amount of portland cement and SCM used in portland cement concrete shall conform to the minimum cementitious material content provisions in Section 90-1.01, "Description," or Section 90-4.05, "Optional Use of Chemical Admixtures," and the following:

- A. If a blended cement conforming to the provisions in Section 90-2.01A, "Cement," is used, the minimum amount of SCM incorporated into the cement shall conform to the provisions in this Section 90-2.01C.
- B. Fly ash or natural pozzolan, silica fume, or GGBFS shall not be used with Type IP or Type IS cements.

Use of SCMs shall conform to the following:

- A. If fly ash or natural pozzolan is used:
  1. The minimum amount of portland cement shall not be less than 75 percent by mass of the specified minimum cementitious material content.
  2. The minimum amount of fly ash or natural pozzolan shall be:
    - a. Fifteen percent by mass of the total amount of cementitious material if the calcium oxide content of fly ash or natural pozzolan is equal to or less than 2 percent by mass;
    - b. Twenty-five percent by mass of the total amount of cementitious material if the calcium oxide content of fly ash or natural pozzolan is greater than 2 percent by mass.
- B. The total amount of fly ash or natural pozzolan shall not exceed 35 percent by mass of the total amount of cementitious material to be used in the mix. If Section 90-1.01, "Description," specifies a maximum cementitious material content in kilograms per cubic meter, the total mass of portland cement and fly ash or natural pozzolan per cubic meter shall not exceed the specified maximum cementitious material content.
- C. If silica fume is used:
  1. The amount of silica fume shall not be less than 10 percent by mass of the total amount of cementitious material.
  2. The amount of portland cement shall not be less than 75 percent by mass of the specified minimum cementitious material content.
  3. If Section 90-1.01, "Description," specifies a maximum cementitious material content in kilograms per cubic meter, the total mass of portland cement and silica fume per cubic meter shall not exceed the specified maximum cementitious material content.
- D. If GGBFS is used:
  1. The minimum amount of GGBFS shall be either:

- a. Forty percent of the total cementitious material to be used, if the aggregates used in the concrete are on the Department's list of "Approved Aggregates For Use in Concrete with Reduced Fly Ash."
  - b. No less than 50 percent.
2. The amount of GGBFS shall not exceed 60 percent by mass of the total amount of cementitious materials to be used.

## **90-2.02 AGGREGATES**

Aggregates shall be free from deleterious coatings, clay balls, roots, bark, sticks, rags, and other extraneous material.

The Contractor shall provide safe and suitable facilities, including necessary splitting devices for obtaining samples of aggregates, in conformance with California Test 125.

Aggregates shall be of such character that it will be possible to produce workable concrete within the limits of water content provided in Section 90-6.06, "Amount of Water and Penetration."

Aggregates shall have not more than 10 percent loss when tested for soundness in conformance with the requirements in California Test 214. The soundness requirement for fine aggregate will be waived, provided that the durability index,  $D_f$ , of the fine aggregate is 60 or greater when tested for durability in conformance with California Test 229.

If the results of any one or more of the Cleanness Value, Sand Equivalent, or aggregate grading tests do not meet the requirements specified for "Operating Range" but all meet the "Contract Compliance" requirements, the placement of concrete shall be suspended at the completion of the current pour until tests or other information indicate that the next material to be used in the work will comply with the requirements specified for "Operating Range."

If the results of either or both the Cleanness Value and coarse aggregate grading tests do not meet the requirements specified for "Contract Compliance," the concrete that is represented by the tests shall be removed. However, if the Engineer determines that the concrete is structurally adequate, the concrete may remain in place, and the Contractor shall pay to the State \$4.60 per cubic meter for paving concrete and \$7.20 per cubic meter for all other concrete for the concrete represented by these tests and left in place. The Department may deduct the amount from any moneys due, or that may become due, the Contractor under the contract.

If the results of either or both the Sand Equivalent and fine aggregate grading tests do not meet the requirements specified for "Contract Compliance," the concrete that is represented by the tests shall be removed. However, if the Engineer determines that the concrete is structurally adequate, the concrete may remain in place and the Contractor shall pay to the State \$4.60 per cubic meter for paving concrete and \$7.20 per cubic meter for all other concrete for the concrete represented by these tests and left in place. The Department may deduct the amount from any moneys due, or that may become due, the Contractor under the contract.

The 2 preceding paragraphs apply individually to the "Contract Compliance" requirements for coarse aggregate and fine aggregate. When both coarse aggregate and fine aggregate do not conform to the "Contract Compliance" requirements, both paragraphs shall apply. The payments specified in those paragraphs are in addition to any payments made in conformance with the provisions in Section 90-1.01, "Description."

No single Cleanness Value, Sand Equivalent, or aggregate grading test shall represent more than 250 m<sup>3</sup> of concrete or one day's pour, whichever is smaller.

When the source of an aggregate is changed, the Contractor shall adjust the mix proportions and submit in writing to the Engineer a copy of the mix design before using the aggregates.

### **90-2.02A COARSE AGGREGATE**

Coarse aggregate shall consist of gravel, crushed gravel, crushed rock, reclaimed aggregate, crushed air-cooled iron blast furnace slag or combinations thereof. Crushed air-cooled blast furnace slag shall not be used in reinforced or prestressed concrete.

Reclaimed aggregate is aggregate that has been recovered from plastic concrete by washing away the cementitious material. Reclaimed aggregate shall conform to all aggregate requirements.

Coarse aggregate shall conform to the following quality requirements:

Tests	California Test	Requirements
Loss in Los Angeles Rattler (after 500 revolutions)	211	45% max.
Cleanness Value		
Operating Range	227	75 min.
Contract Compliance	227	71 min.

In lieu of the above Cleanness Value requirements, a Cleanness Value "Operating Range" limit of 71, minimum, and a Cleanness Value "Contract Compliance" limit of 68, minimum, will be used to determine the acceptability of the coarse aggregate if the Contractor furnishes a Certificate of Compliance, as provided in Section 6-1.07, "Certificates of Compliance," certifying that:

- A. Coarse aggregate sampled at the completion of processing at the aggregate production plant had a Cleanness Value of not less than 82 when tested in conformance with the requirements in California Test 227; and
- B. Prequalification tests performed in conformance with the requirements in California Test 549 indicated that the aggregate would develop a relative strength of not less than 95 percent and would have a relative shrinkage not greater than 105 percent, based on concrete.

#### **90-2.02B FINE AGGREGATE**

Fine aggregate shall consist of natural sand, manufactured sand produced from larger aggregate or a combination thereof. Manufactured sand shall be well graded.

Fine aggregate shall conform to the following quality requirements:

Test	California Test	Requirements
Organic Impurities	213	Satisfactory <sup>a</sup>
Mortar Strengths Relative to Ottawa Sand	515	95%, min.
Sand Equivalent:		
Operating Range	217	75, min.
Contract Compliance	217	71, min.

- a Fine aggregate developing a color darker than the reference standard color solution may be accepted if it is determined by the Engineer, from mortar strength tests, that a darker color is acceptable.

In lieu of the above Sand Equivalent requirements, a Sand Equivalent "Operating Range" limit of 71, minimum, and a Sand Equivalent "Contract Compliance" limit of 68, minimum, will be used to determine the acceptability of the fine aggregate if the Contractor furnishes a Certificate of Compliance, as provided in Section 6-1.07, "Certificates of Compliance," certifying that:

- A. Fine aggregate sampled at the completion of processing at the aggregate production plant had a Sand Equivalent value of not less than 82 when tested by California Test 217; and
- B. Prequalification tests performed in conformance with California Test 549 indicated that the aggregate would develop a relative strength of not less than 95 percent and would have a relative shrinkage not greater than 105 percent, based on concrete.

#### **90-2.03 WATER**

In conventionally reinforced concrete work, the water for curing, for washing aggregates, and for mixing shall be free from oil and shall not contain more than 1000 parts per million of chlorides as Cl, when tested in conformance with California Test 422, nor more than 1300 parts per million of sulfates as SO<sub>4</sub>, when tested in conformance with California Test 417. In prestressed concrete work, the water for curing, for washing aggregates, and for mixing shall be free from oil and shall not contain more than 650 parts per million of chlorides as Cl, when tested in conformance with California Test 422, nor more than 1300 parts per million of sulfates as SO<sub>4</sub>, when tested in conformance with California Test 417. In no case shall the water contain an amount of impurities that will cause either: 1) a change in the setting time of cement of more than 25 percent when tested in conformance with the requirements in ASTM Designation: C 191 or ASTM Designation: C 266 or 2) a reduction in the compressive strength of mortar at 14 days of more than 5 percent, when tested in conformance with the requirements in ASTM



Designation: C 109, when compared to the results obtained with distilled water or deionized water, tested in conformance with the requirements in ASTM Designation: C 109.

In nonreinforced concrete work, the water for curing, for washing aggregates and for mixing shall be free from oil and shall not contain more than 2000 parts per million of chlorides as Cl, when tested in conformance with California Test 422, or more than 1500 parts per million of sulfates as SO<sub>4</sub>, when tested in conformance with California Test 417.

In addition to the above provisions, water for curing concrete shall not contain impurities in a sufficient amount to cause discoloration of the concrete or produce etching of the surface.

Water reclaimed from mixer wash-out operations may be used in mixing concrete. The water shall not contain coloring agents or more than 300 parts per million of alkalis (Na<sub>2</sub>O + 0.658 K<sub>2</sub>O) as determined on the filtrate. The specific gravity of the water shall not exceed 1.03 and shall not vary more than ±0.010 during a day's operations.

#### **90-2.04 ADMIXTURE MATERIALS**

Admixture materials shall conform to the requirements in the following ASTM Designations:

- A. Chemical Admixtures—ASTM Designation: C 494.
- B. Air-entraining Admixtures—ASTM Designation: C 260.

### **90-3 AGGREGATE GRADINGS**

#### **90-3.01 GENERAL**

Before beginning concrete work, the Contractor shall submit in writing to the Engineer the gradation of the primary aggregate nominal sizes that the Contractor proposes to furnish. If a primary coarse aggregate or the fine aggregate is separated into 2 or more sizes, the proposed gradation shall consist of the gradation for each individual size, and the proposed proportions of each individual size, combined mathematically to indicate one proposed gradation. The proposed gradation shall meet the grading requirements shown in the table in this section, and shall show the percentage passing each of the sieve sizes used in determining the end result.

The Engineer may waive, in writing, the gradation requirements in this Section 90-3.01 and in Sections 90-3.02, "Coarse Aggregate Grading," 90-3.03, "Fine Aggregate Grading," and 90-3.04, "Combined Aggregate Gradings," if, in the Engineer's opinion, furnishing the gradation is not necessary for the type or amount of concrete work to be constructed.

Gradations proposed by the Contractor shall be within the following percentage passing limits:

Primary Aggregate Nominal Size	Sieve Size	Limits of Proposed Gradation
37.5-mm x 19-mm	25-mm	19 - 41
25-mm x 4.75-mm	19-mm	52 - 85
25-mm x 4.75-mm	9.5-mm	15 - 38
12.5-mm x 4.75-mm	9.5-mm	40 - 78
9.5-mm x 2.36-mm	9.5-mm	50 - 85
Fine Aggregate	1.18-mm	55 - 75
Fine Aggregate	600-μm	34 - 46
Fine Aggregate	300-μm	16 - 29

Should the Contractor change the source of supply, the Contractor shall submit in writing to the Engineer the new gradations before their intended use.

#### **90-3.02 COARSE AGGREGATE GRADING**

The grading requirements for coarse aggregates are shown in the following table for each size of coarse aggregate:

Sieve Sizes	Percentage Passing Primary Aggregate Nominal Sizes							
	37.5-mm x 19-mm		25-mm x 4.75-mm		12.5-mm x 4.75-mm		9.5-mm x 2.36-mm	
	Operating Range	Contract Compliance	Operating Range	Contract Compliance	Operating Range	Contract Compliance	Operating Range	Contract Compliance
50-mm	100	100	—	—	—	—	—	—
37.5-mm	88 - 100	85 - 100	100	100	—	—	—	—
25-mm	X $\pm$ 18	X $\pm$ 25	88 - 100	86 - 100	—	—	—	—
19-mm	0 - 17	0 - 20	X $\pm$ 15	X $\pm$ 22	100	100	—	—
12.5-mm	—	—	—	—	82 - 100	80 - 100	100	100
9.5-mm	0 - 7	0 - 9	X $\pm$ 15	X $\pm$ 22	X $\pm$ 15	X $\pm$ 22	X $\pm$ 15	X $\pm$ 20
4.75-mm	—	—	0 - 16	0 - 18	0 - 15	0 - 18	0 - 25	0 - 28
2.36-mm	—	—	0 - 6	0 - 7	0 - 6	0 - 7	0 - 6	0 - 7

In the above table, the symbol X is the gradation that the Contractor proposes to furnish for the specific sieve size as provided in Section 90-3.01, "General."

Coarse aggregate for the 37.5-mm, maximum, combined aggregate grading as provided in Section 90-3.04, "Combined Aggregate Gradings," shall be furnished in 2 or more primary aggregate nominal sizes. Each primary aggregate nominal size may be separated into 2 sizes and stored separately, provided that the combined material conforms to the grading requirements for that particular primary aggregate nominal size.

When the 25-mm, maximum, combined aggregate grading as provided in Section 90-3.04, "Combined Aggregate Gradings," is to be used, the coarse aggregate may be separated into 2 sizes and stored separately, provided that the combined material shall conform to the grading requirements for the 25-mm x 4.75-mm primary aggregate nominal size.

### 90-3.03 FINE AGGREGATE GRADING

Fine aggregate shall be graded within the following limits:

Sieve Sizes	Percentage Passing	
	Operating Range	Contract Compliance
9.5-mm	100	100
4.75-mm	95 - 100	93 - 100
2.36-mm	65 - 95	61 - 99
1.18-mm	X $\pm$ 10	X $\pm$ 13
600- $\mu$ m	X $\pm$ 9	X $\pm$ 12
300- $\mu$ m	X $\pm$ 6	X $\pm$ 9
150- $\mu$ m	2 - 12	1 - 15
75- $\mu$ m	0 - 8	0 - 10

In the above table, the symbol X is the gradation that the Contractor proposes to furnish for the specific sieve size as provided in Section 90-3.01, "General."

In addition to the above required grading analysis, the distribution of the fine aggregate sizes shall be such that the difference between the total percentage passing the 1.18-mm sieve and the total percentage passing the 600- $\mu$ m sieve shall be between 10 and 40, and the difference between the percentage passing the 600- $\mu$ m and 300- $\mu$ m sieves shall be between 10 and 40.

Fine aggregate may be separated into 2 or more sizes and stored separately, provided that the combined material conforms to the grading requirements specified in this Section 90-3.03.

### 90-3.04 COMBINED AGGREGATE GRADINGS

Combined aggregate grading limits shall be used only for the design of concrete mixes. Concrete mixes shall be designed so that aggregates are combined in proportions that shall produce a mixture within the grading limits for combined aggregates as specified herein.

The combined aggregate grading, except when otherwise specified in these specifications or the special provisions, shall be either the 37.5-mm, maximum grading, or the 25-mm, maximum grading, at the option of the Contractor.

Grading Limits of Combined Aggregates

Sieve Sizes	Percentage Passing			
	37.5-mm Max.	25-mm Max.	12.5-mm Max.	9.5-mm Max.
50-mm	100	—	—	—
37.5-mm	90 - 100	100	—	—
25-mm	50 - 86	90 - 100	—	—
19-mm	45 - 75	55 - 100	100	—
12.5-mm	—	—	90-100	100
9.5-mm	38 - 55	45 - 75	55 - 86	50 - 100
4.75-mm	30 - 45	35 - 60	45 - 63	45 - 63
2.36-mm	23 - 38	27 - 45	35 - 49	35 - 49
1.18-mm	17 - 33	20 - 35	25 - 37	25 - 37
600- $\mu$ m	10 - 22	12 - 25	15 - 25	15 - 25
300- $\mu$ m	4 - 10	5 - 15	5 - 15	5 - 15
150- $\mu$ m	1 - 6	1 - 8	1 - 8	1 - 8
75- $\mu$ m	0 - 3	0 - 4	0 - 4	0 - 4

Changes from one grading to another shall not be made during the progress of the work unless permitted by the Engineer.

## 90-4 ADMIXTURES

### 90-4.01 GENERAL

Admixtures used in portland cement concrete shall conform to and be used in conformance with the provisions in this Section 90-4 and the special provisions. Admixtures shall be used when specified or ordered by the Engineer and may be used at the Contractor's option as provided herein.

Chemical admixtures and air-entraining admixtures containing chlorides as Cl in excess of one percent by mass of admixture, as determined by California Test 415, shall not be used.

Admixtures shall be uniform in properties throughout their use in the work. Should it be found that an admixture as furnished is not uniform in properties, its use shall be discontinued.

If more than one admixture is used, the admixtures shall be compatible with each other so that the desirable effects of all admixtures used will be realized.

Chemical admixtures shall be used in conformance with the manufacturer's written recommendations.

### 90-4.02 MATERIALS

Admixture materials shall conform to the provisions in Section 90-2.04, "Admixture Materials."

### 90-4.03 ADMIXTURE APPROVAL

No admixture brand shall be used in the work unless it is on the Department's current list of approved brands for the type of admixture involved.

Admixture brands will be considered for addition to the approved list if the manufacturer of the admixture submits to the Transportation Laboratory a sample of the admixture accompanied by certified test results demonstrating that the admixture complies with the requirements in the appropriate ASTM Designation and these specifications. The sample shall be sufficient to permit performance of all required tests. Approval of admixture brands will be dependent upon a determination as to compliance with the requirements, based on the certified test results submitted, together with tests the Department may elect to perform.

If the Contractor proposes to use an admixture of a brand and type on the current list of approved admixture brands, the Contractor shall furnish a Certificate of Compliance from the manufacturer, as provided in Section 6-1.07, "Certificates of Compliance," certifying that the admixture furnished is the same as that previously approved. If a previously approved admixture is not accompanied by a Certificate of Compliance, the admixture shall not be used in the work until the Engineer has had sufficient time to make the appropriate tests and has approved the admixture for use. The Engineer may take samples for testing at any time, whether or not the admixture has been accompanied by a Certificate of Compliance.

### 90-4.04 REQUIRED USE OF CHEMICAL ADMIXTURES

If the use of a chemical admixture is specified, the admixture shall be used at the dosage specified, except that if no dosage is specified, the admixture shall be used at the dosage normally recommended by the manufacturer of the admixture.

#### **90-4.05 OPTIONAL USE OF CHEMICAL ADMIXTURES**

The Contractor may use Type A or F, water-reducing; Type B, retarding; or Type D or G, water-reducing and retarding admixtures as described in ASTM Designation: C 494 to conserve cementitious material or to facilitate any concrete construction application subject to the following conditions:

- A. If a water-reducing admixture or a water-reducing and retarding admixture is used, the cementitious material content specified or ordered may be reduced by a maximum of 5 percent by mass, except that the resultant cementitious material content shall be not less than 300 kilograms per cubic meter; and
- B. When a reduction in cementitious material content is made, the dosage of admixture used shall be the dosage used in determining approval of the admixture.

Unless otherwise specified, a Type C accelerating chemical admixture conforming to the requirements in ASTM Designation: C 494, may be used in portland cement concrete. Inclusion in the mix design submitted for approval will not be required provided that the admixture is added to counteract changing conditions that contribute to delayed setting of the portland cement concrete, and the use or change in dosage of the admixture is approved in writing by the Engineer.

#### **90-4.06 REQUIRED USE OF AIR-ENTRAINING ADMIXTURES**

When air-entrainment is specified or ordered by the Engineer, the air-entraining admixture shall be used in amounts to produce a concrete having the specified air content as determined by California Test 504.

#### **90-4.07 OPTIONAL USE OF AIR-ENTRAINING ADMIXTURES**

When air-entrainment has not been specified or ordered by the Engineer, the Contractor will be permitted to use an air-entraining admixture to facilitate the use of any construction procedure or equipment provided that the average air content, as determined by California Test 504, of 3 successive tests does not exceed 4 percent, and no single test value exceeds 5.5 percent. If the Contractor elects to use an air-entraining admixture in concrete for pavement, the Contractor shall so indicate at the time the Contractor designates the source of aggregate.

#### **90-4.08 BLANK**

#### **90-4.09 BLANK**

#### **90-4.10 PROPORTIONING AND DISPENSING LIQUID ADMIXTURES**

Chemical admixtures and air-entraining admixtures shall be dispensed in liquid form. Dispensers for liquid admixtures shall have sufficient capacity to measure at one time the prescribed quantity required for each batch of concrete. Each dispenser shall include a graduated measuring unit into which liquid admixtures are measured to within  $\pm 5$  percent of the prescribed quantity for each batch. Dispensers shall be located and maintained so that the graduations can be accurately read from the point at which proportioning operations are controlled to permit a visual check of batching accuracy prior to discharge. Each measuring unit shall be clearly marked for the type and quantity of admixture.

Each liquid admixture dispensing system shall be equipped with a sampling device consisting of a valve located in a safe and readily accessible position such that a sample of the admixture may be withdrawn slowly by the Engineer.

If more than one liquid admixture is used in the concrete mix, each liquid admixture shall have a separate measuring unit and shall be dispensed by injecting equipment located in such a manner that the admixtures are not mixed at high concentrations and do not interfere with the effectiveness of each other. When air-entraining admixtures are used in conjunction with other liquid admixtures, the air-entraining admixture shall be the first to be incorporated into the mix, unless it is demonstrated that a different sequence improves performance.

When automatic proportioning devices are required for concrete pavement, dispensers for liquid admixtures shall operate automatically with the batching control equipment. The dispensers shall be equipped with an automatic warning system in good operating condition that will provide a visible or audible signal at the point at which proportioning operations are controlled when the quantity of admixture measured for each batch of concrete varies from the preselected dosage by more than 5 percent, or when the entire contents of the measuring unit are not emptied from the dispenser into each batch of concrete.

Unless liquid admixtures are added to premeasured water for the batch, their discharge into the batch shall be arranged to flow into the stream of water so that the admixtures are well dispersed throughout the batch, except that

air-entraining admixtures may be dispensed directly into moist sand in the batching bins provided that adequate control of the air content of the concrete can be maintained.

Liquid admixtures requiring dosages greater than 2.5 L/m<sup>3</sup> shall be considered to be water when determining the total amount of free water as specified in Section 90-6.06, "Amount of Water and Penetration."

#### **90-4.11 BLANK**

### **90-5 PROPORTIONING**

#### **90-5.01 STORAGE OF AGGREGATES**

Aggregates shall be stored or stockpiled in such a manner that separation of coarse and fine particles of each size shall be avoided and the various sizes shall not become intermixed before proportioning.

Aggregates shall be stored or stockpiled and handled in a manner that prevent contamination by foreign materials. In addition, storage of aggregates at batching or mixing facilities that are erected subsequent to the award of the contract and that furnish concrete to the project shall conform to the following:

- A. Intermingling of the different sizes of aggregates shall be positively prevented. The Contractor shall take the necessary measures to prevent intermingling. The preventive measures may include, but are not necessarily limited to, physical separation of stockpiles or construction of bulkheads of adequate length and height; and
- B. Contamination of aggregates by contact with the ground shall be positively prevented. The Contractor shall take the necessary measures to prevent contamination. The preventive measures shall include, but are not necessarily limited to, placing aggregates on wooden platforms or on hardened surfaces consisting of portland cement concrete, asphalt concrete, or cement treated material.

In placing aggregates in storage or in moving the aggregates from storage to the weigh hopper of the batching plant, any method that may cause segregation, degradation, or the combining of materials of different gradings that will result in any size of aggregate at the weigh hopper failing to meet the grading requirements shall be discontinued. Any method of handling aggregates that results in excessive breakage of particles shall be discontinued. The use of suitable devices to reduce impact of falling aggregates may be required by the Engineer.

#### **90-5.02 PROPORTIONING DEVICES**

Weighing, measuring, or metering devices used for proportioning materials shall conform to the requirements in Section 9-1.01, "Measurement of Quantities," and this Section 90-5.02. In addition, automatic weighing systems shall comply with the requirements for automatic proportioning devices in Section 90-5.03A, "Proportioning for Pavement." Automatic devices shall be automatic to the extent that the only manual operation required for proportioning the aggregates, cement, and supplementary cementitious material for one batch of concrete is a single operation of a switch or starter.

Proportioning devices shall be tested as frequently as the Engineer may deem necessary to ensure their accuracy.

Weighing equipment shall be insulated against vibration or movement of other operating equipment in the plant. When the plant is in operation, the mass of each batch of material shall not vary from the mass designated by the Engineer by more than the tolerances specified herein.

Equipment for cumulative weighing of aggregate shall have a zero tolerance of  $\pm 0.5$  percent of the designated total batch mass of the aggregate. For systems with individual weigh hoppers for the various sizes of aggregate, the zero tolerance shall be  $\pm 0.5$  percent of the individual batch mass designated for each size of aggregate. Equipment for cumulative weighing of cement and supplementary cementitious material shall have a zero tolerance of  $\pm 0.5$  percent of the designated total batch mass of the cement and supplementary cementitious material. Equipment for weighing cement or supplementary cementitious material separately shall have a zero tolerance of  $\pm 0.5$  percent of their designated individual batch masses. Equipment for measuring water shall have a zero tolerance of  $\pm 0.5$  percent of its designated mass or volume.

The mass indicated for any batch of material shall not vary from the preselected scale setting by more than the following:

- A. Aggregate weighed cumulatively shall be within 1.0 percent of the designated total batch mass of the aggregate. Aggregates weighed individually shall be within 1.5 percent of their respective designated batch masses; and
- B. Cement shall be 99 to 102 percent of its designated batch mass. When weighed individually, supplementary cementitious material shall be 99 to 102 percent of its designated batch mass. When

supplementary cementitious material and cement are permitted to be weighed cumulatively, cement shall be weighed first to 99 to 102 percent of its designated batch mass, and the total for cement and supplementary cementitious material shall be 99 to 102 percent of the sum of their designated batch masses; and

- C. Water shall be within 1.5 percent of its designated mass or volume.

Each scale graduation shall be approximately 0.001 of the total capacity of the scale. The capacity of scales for weighing cement, supplementary cementitious material, or cement plus supplementary cementitious material and aggregates shall not exceed that of commercially available scales having single graduations indicating a mass not exceeding the maximum permissible mass variation above, except that no scale shall be required having a capacity of less than 500 kg, with 0.5-kg graduations.

### **90-5.03 PROPORTIONING**

Proportioning shall consist of dividing the aggregates into the specified sizes, each stored in a separate bin, and combining them with cementitious material and water as provided in these specifications. Aggregates shall be proportioned by mass.

At the time of batching, aggregates shall have been dried or drained sufficiently to result in a stable moisture content such that no visible separation of water from aggregate will take place during transportation from the proportioning plant to the point of mixing. In no event shall the free moisture content of the fine aggregate at the time of batching exceed 8 percent of its saturated, surface-dry mass.

Should separate supplies of aggregate material of the same size group, but of different moisture content or specific gravity or surface characteristics affecting workability, be available at the proportioning plant, withdrawals shall be made from one supply exclusively and the materials therein completely exhausted before starting upon another.

Bulk Type IP (MS) cement shall be weighed in an individual hopper and shall be kept separate from the aggregates until the ingredients are released for discharge into the mixer.

Bulk cement and supplementary cementitious material may be weighed in separate, individual weigh hoppers or may be weighed in the same weigh hopper and shall be kept separate from the aggregates until the ingredients are released for discharge into the mixer. If the cement and supplementary cementitious material are weighed cumulatively, the cement shall be weighed first.

If cement and supplementary cementitious material are weighed in separate weigh hoppers, the weigh systems for the proportioning of the aggregate, the cement, and the supplementary cementitious material shall be individual and distinct from all other weigh systems. Each weigh system shall be equipped with a hopper, a lever system, and an indicator to constitute an individual and independent material weighing device. The cement and the supplementary cementitious material shall be discharged into the mixer simultaneously with the aggregate.

The scales and weigh hoppers for bulk weighing cement, supplementary cementitious material, or cement plus supplementary cementitious material shall be separate and distinct from the aggregate weighing equipment.

For batches of one cubic meter or more, the batching equipment shall conform to one of the following combinations:

- A. Separate boxes and separate scale and indicator for weighing each size of aggregate.
- B. Single box and scale indicator for all aggregates.
- C. Single box or separate boxes and automatic weighing mechanism for all aggregates.

In order to check the accuracy of batch masses, the gross mass and tare mass of batch trucks, truck mixers, truck agitators, and non-agitating hauling equipment shall be determined when ordered by the Engineer. The equipment shall be weighed on scales designated by the Engineer.

### **90-5.03A PROPORTIONING FOR PAVEMENT**

Aggregates and bulk supplementary cementitious material for use in pavement shall be proportioned by mass by means of automatic proportioning devices of approved type conforming to these specifications.

The Contractor shall install and maintain in operating condition an electronically actuated moisture meter that will indicate, on a readily visible scale, changes in the moisture content of the fine aggregate as it is batched within a sensitivity of 0.5 percent by mass of the fine aggregate.

The batching of cement, supplementary cementitious material, or cement plus supplementary cementitious material and aggregate shall be interlocked so that a new batch cannot be started until all weigh hoppers are empty, the proportioning devices are within zero tolerance, and the discharge gates are closed. The interlock shall permit no part of the batch to be discharged until all aggregate hoppers and the cement and supplementary cementitious

material hoppers or the cement plus supplementary cementitious material hopper are charged with masses that are within the tolerances specified in Section 90-5.02, "Proportioning Devices."

If interlocks are required for cement and supplementary cementitious material charging mechanisms and cement and supplementary cementitious material are weighed cumulatively, their charging mechanisms shall be interlocked to prevent the introduction of mineral admixture until the mass of cement in the cement weigh hopper is within the tolerances specified in Section 90-5.02, "Proportioning Devices."

If concrete is completely mixed in stationary paving mixers, the supplementary cementitious materials shall be weighed in a separate weigh hopper and the supplementary cementitious material and cement shall be introduced simultaneously into the mixer proportionately with the aggregate. If the Contractor provides certification that the stationary mixer is capable of mixing the cement, supplementary cementitious material, aggregates, and water uniformly before discharge, weighing the supplementary cementitious material cumulatively with the cement is permitted. Certification shall contain the following:

- A. Test results for 2 compressive strength test cylinders of concrete taken within the first one-third and 2 compressive strength test cylinders of concrete taken within the last one-third of the concrete discharged from a single batch from the stationary paving mixer. Strength tests and cylinder preparation will be in conformance with the provisions of Section 90-9, "Compressive Strength";
- B. Calculations demonstrating that the difference in the averages of 2 compressive strengths taken in the first one-third is no greater than 7.5 percent different than the averages of 2 compressive strengths taken in the last one-third of the concrete discharged from a single batch from the stationary paving mixer. Strength tests and cylinder preparation will be in conformance with the provisions of Section 90-9, "Compressive Strength;" and
- C. The mixer rotation speed and time of mixing before discharge that are required to produce a mix that meets the requirements above.

The discharge gate on the cement and supplementary cementitious material hoppers or the cement plus supplementary cementitious material hopper shall be designed to permit regulating the flow of cement, supplementary cementitious material, or cement plus supplementary cementitious material into the aggregate as directed by the Engineer.

If separate weigh boxes are used for each size of aggregate, the discharge gates shall permit regulating the flow of each size of aggregate as directed by the Engineer.

Material discharged from the several bins shall be controlled by gates or by mechanical conveyors. The means of withdrawal from the several bins, and of discharge from the weigh box, shall be interlocked so that not more than one bin can discharge at a time, and so that the weigh box cannot be tripped until the required quantity from each of the several bins has been deposited therein. Should a separate weigh box be used for each size of aggregate, all may be operated and discharged simultaneously.

If the discharge from the several bins is controlled by gates, each gate shall be actuated automatically so that the required mass is discharged into the weigh box, after which the gate shall automatically close and lock.

The automatic weighing system shall be designed so that all proportions required may be set on the weighing controller at the same time.

## **90-6 MIXING AND TRANSPORTING**

### **90-6.01 GENERAL**

Concrete shall be mixed in mechanically operated mixers, except that when permitted by the Engineer, batches not exceeding 0.25-m<sup>3</sup> may be mixed by hand methods in conformance with the provisions in Section 90-6.05, "Hand-Mixing."

Equipment having components made of aluminum or magnesium alloys that would have contact with plastic concrete during mixing, transporting, or pumping of portland cement concrete shall not be used.

Concrete shall be homogeneous and thoroughly mixed, and there shall be no lumps or evidence of undispersed cementitious material.

Uniformity of concrete mixtures will be determined by differences in penetration as determined by California Test 533, or slump as determined by ASTM Designation: C 143, and by variations in the proportion of coarse aggregate as determined by California Test 529.

When the mix design specifies a penetration value, the difference in penetration, determined by comparing penetration tests on 2 samples of mixed concrete from the same batch or truck mixer load, shall not exceed 10 mm. When the mix design specifies a slump value, the difference in slump, determined by comparing slump tests on 2 samples of mixed concrete from the same batch or truck mixer load, shall not exceed the values given in the table below. Variation in the proportion of coarse aggregate will be determined by comparing the results of tests of

2 samples of mixed concrete from the same batch or truck mixer load and the difference between the 2 results shall not exceed 100 kg per cubic meter of concrete.

Average Slump	Maximum Permissible Difference
Less than 100-mm	25-mm
100-mm to 150-mm	38-mm
Greater than 150-mm to 225-mm	50-mm

The Contractor shall furnish samples of the freshly mixed concrete and provide satisfactory facilities for obtaining the samples.

#### **90-6.02 MACHINE MIXING**

Concrete mixers may be of the revolving drum or the revolving blade type, and the mixing drum or blades shall be operated uniformly at the mixing speed recommended by the manufacturer. Mixers and agitators that have an accumulation of hard concrete or mortar shall not be used.

The temperature of mixed concrete, immediately before placing, shall be not less than 10°C or more than 32°C. Aggregates and water shall be heated or cooled as necessary to produce concrete within these temperature limits. Neither aggregates nor mixing water shall be heated to exceed 65°C. If ice is used to cool the concrete, discharge of the mixer will not be permitted until all ice is melted.

The batch shall be so charged into the mixer that some water will enter in advance of cementitious materials and aggregates. All water shall be in the drum by the end of the first one-fourth of the specified mixing time.

Cementitious materials shall be batched and charged into the mixer by means that will not result either in loss of cementitious materials due to the effect of wind, in accumulation of cementitious materials on surfaces of conveyors or hoppers, or in other conditions that reduce or vary the required quantity of cementitious material in the concrete mixture.

Paving and stationary mixers shall be operated with an automatic timing device. The timing device and discharge mechanism shall be interlocked so that during normal operation no part of the batch will be discharged until the specified mixing time has elapsed.

The total elapsed time between the intermingling of damp aggregates and all cementitious materials and the start of mixing shall not exceed 30 minutes.

The size of batch shall not exceed the manufacturer's guaranteed capacity.

When producing concrete for pavement or base, suitable batch counters shall be installed and maintained in good operating condition at job site batching plants and stationary mixers. The batch counters shall indicate the exact number of batches proportioned and mixed.

Concrete shall be mixed and delivered to the job site by means of one of the following combinations of operations:

- A. Mixed completely in a stationary mixer and the mixed concrete transported to the point of delivery in truck agitators or in nonagitating hauling equipment (central-mixed concrete).
- B. Mixed partially in a stationary mixer, and the mixing completed in a truck mixer (shrink-mixed concrete).
- C. Mixed completely in a truck mixer (transit-mixed concrete).
- D. Mixed completely in a paving mixer.

Agitators may be truck mixers operating at agitating speed or truck agitators. Each mixer and agitator shall have attached thereto in a prominent place a metal plate or plates on which is plainly marked the various uses for which the equipment is designed, the manufacturer's guaranteed capacity of the drum or container in terms of the volume of mixed concrete and the speed of rotation of the mixing drum or blades.

Truck mixers shall be equipped with electrically or mechanically actuated revolution counters by which the number of revolutions of the drum or blades may readily be verified.

When shrink-mixed concrete is furnished, concrete that has been partially mixed at a central plant shall be transferred to a truck mixer and all requirements for transit-mixed concrete shall apply. No credit in the number of revolutions at mixing speed will be allowed for partial mixing in a central plant.

#### **90-6.03 TRANSPORTING MIXED CONCRETE**

Mixed concrete may be transported to the delivery point in truck agitators or truck mixers operating at the speed designated by the manufacturer of the equipment as agitating speed, or in nonagitating hauling equipment, provided the consistency and workability of the mixed concrete upon discharge at the delivery point is suitable for adequate



placement and consolidation in place, and provided the mixed concrete after hauling to the delivery point conforms to the provisions in Section 90-6.01, "General."

Truck agitators shall be loaded not to exceed the manufacturer's guaranteed capacity and shall maintain the mixed concrete in a thoroughly mixed and uniform mass during hauling.

Bodies of nonagitator hauling equipment shall be constructed so that leakage of the concrete mix, or any part thereof, will not occur at any time.

Concrete hauled in open-top vehicles shall be protected during hauling against rain or against exposure to the sun for more than 20 minutes when the ambient temperature exceeds 24°C.

No additional mixing water shall be incorporated into the concrete during hauling or after arrival at the delivery point, unless authorized by the Engineer. If the Engineer authorizes additional water to be incorporated into the concrete, the drum shall be revolved not less than 30 revolutions at mixing speed after the water is added and before discharge is commenced.

The rate of discharge of mixed concrete from truck mixer-agitators shall be controlled by the speed of rotation of the drum in the discharge direction with the discharge gate fully open.

If a truck mixer or agitator is used for transporting concrete to the delivery point, discharge shall be completed within 1.5 hours or before 250 revolutions of the drum or blades, whichever occurs first, after the introduction of the cement to the aggregates. Under conditions contributing to quick stiffening of the concrete, or if the temperature of the concrete is 30°C or above, the time allowed may be less than 1.5 hours. If an admixture is used to retard the set time, the temperature of the concrete shall not exceed 30°C, the time limit shall be 2 hours, and the revolution limitation shall be 300.

If nonagitator hauling equipment is used for transporting concrete to the delivery point, discharge shall be completed within one hour after the addition of the cement to the aggregates. Under conditions contributing to quick stiffening of the concrete, or when the temperature of the concrete is 30°C or above, the time between the introduction of cement to the aggregates and discharge shall not exceed 45 minutes.

Each load of concrete delivered at the job site shall be accompanied by a weighmaster certificate showing the mix identification number, nonrepeating load number, date and time at which the materials were batched, the total amount of water added to the load, and for transit-mixed concrete, the reading of the revolution counter at the time the truck mixer is charged with cement. This weighmaster certificate shall also show the actual scale masses (kilograms) for the ingredients batched. Theoretical or target batch masses shall not be used as a substitute for actual scale masses.

Weighmaster certificates shall be provided in printed form, or if approved by the Engineer, the data may be submitted in electronic media. Electronic media shall be presented in a tab-delimited format on a 90 mm diskette with a capacity of at least 1.4 megabytes. Captured data, for the ingredients represented by each batch shall be "line feed, carriage return" (LFCR) and "one line, separate record" with allowances for sufficient fields to satisfy the amount of data required by these specifications.

The Contractor may furnish a weighmaster certificate accompanied by a separate certificate that lists the actual batch masses or measurements for a load of concrete provided that both certificates are imprinted with the same nonrepeating load number that is unique to the contract and delivered to the job site with the load.

Weighmaster certificates furnished by the Contractor shall conform to the provisions in Section 9-1.01, "Measurement of Quantities."

#### **90-6.04 TIME OR AMOUNT OF MIXING**

Mixing of concrete in paving or stationary mixers shall continue for the required mixing time after all ingredients, except water and admixture, if added with the water, are in the mixing compartment of the mixer before any part of the batch is released. Transfer time in multiple drum mixers shall not be counted as part of the required mixing time.

The required mixing time, in paving or stationary mixers, of concrete used for concrete structures, except minor structures, shall be not less than 90 seconds or more than 5 minutes, except that when directed by the Engineer in writing, the requirements of the following paragraph shall apply.

The required mixing time, in paving or stationary mixers, except as provided in the preceding paragraph, shall be not less than 50 seconds or more than 5 minutes.

The minimum required revolutions at the mixing speed for transit-mixed concrete shall not be less than that recommended by the mixer manufacturer, but in no case shall the number of revolutions be less than that required to consistently produce concrete conforming to the provisions for uniformity in Section 90-6.01, "General."

When a high range water-reducing admixture is added to the concrete at the job site, the total number of revolutions shall not exceed 300.

### 90-6.05 HAND-MIXING

Hand-mixed concrete shall be made in batches of not more than  $0.25\text{-m}^3$  and shall be mixed on a watertight, level platform. The proper amount of coarse aggregate shall be measured in measuring boxes and spread on the platform and the fine aggregate shall be spread on this layer, the 2 layers being not more than 0.3-meters in total depth. On this mixture shall be spread the dry cementitious materials and the whole mass turned no fewer than 2 times dry; then sufficient clean water shall be added, evenly distributed, and the whole mass again turned no fewer than 3 times, not including placing in the carriers or forms.

### 90-6.06 AMOUNT OF WATER AND PENETRATION

The amount of water used in concrete mixes shall be regulated so that the penetration of the concrete as determined by California Test 533 or the slump of the concrete as determined by ASTM Designation: C 143 is within the nominal values shown in the following table. When the penetration or slump of the concrete is found to exceed the nominal values listed, the mixture of subsequent batches shall be adjusted to reduce the penetration or slump to a value within the nominal range shown. Batches of concrete with a penetration or slump exceeding the maximum values listed shall not be used in the work. If Type F or Type G chemical admixtures are added to the mix, the penetration requirements shall not apply and the slump shall not exceed 225 mm after the chemical admixtures are added.

Type of Work	Nominal		Maximum	
	Penetration (mm)	Slump (mm)	Penetration (mm)	Slump (mm)
Concrete Pavement	0 - 25	—	40	—
Non-reinforced concrete facilities	0 - 35	—	50	—
Reinforced concrete structures				
Sections over 300-mm thick	0 - 35	—	65	—
Sections 300-mm thick or less	0 - 50	—	75	—
Concrete placed under water	—	150 - 200	—	225
Cast-in-place concrete piles	65 - 90	130 - 180	100	200

The amount of free water used in concrete shall not exceed  $183\text{ kg/m}^3$ , plus 20 kg for each required 100 kg of cementitious material in excess of  $325\text{ kg/m}^3$ .

The term free water is defined as the total water in the mixture minus the water absorbed by the aggregates in reaching a saturated surface-dry condition.

If there are adverse or difficult conditions that affect the placing of concrete, the above specified penetration and free water content limitations may be exceeded providing the Contractor is granted permission by the Engineer in writing to increase the cementitious material content per cubic meter of concrete. The increase in water and cementitious material shall be at a ratio not to exceed 30 kg of water per added 100 kg of cementitious material per cubic meter. Full compensation for additional cementitious material and water added under these conditions shall be considered as included in the contract price paid for the concrete work involved and no additional compensation will be allowed therefor.

The equipment for supplying water to the mixer shall be constructed and arranged so that the amount of water added can be measured accurately. Any method of discharging water into the mixer for a batch shall be accurate within 1.5 percent of the quantity of water required to be added to the mix for any position of the mixer. Tanks used to measure water shall be designed so that water cannot enter while water is being discharged into the mixer and discharge into the mixer shall be made rapidly in one operation without dribbling. All equipment shall be arranged so as to permit checking the amount of water delivered by discharging into measured containers.

## 90-7 CURING CONCRETE

### 90-7.01 METHODS OF CURING

Newly placed concrete shall be cured by the methods specified in this Section 90-7.01 and the special provisions.

#### 90-7.01A WATER METHOD

The concrete shall be kept continuously wet by the application of water for a minimum curing period of 7 days after the concrete has been placed.

Cotton mats, rugs, carpets, or earth or sand blankets may be used as a curing medium to retain the moisture during the curing period.

If a curing medium consisting of cotton mats, rugs, carpets, polyethylene sheeting, polyethylene sheeting on burlap, or earth or sand blankets is to be used to retain the moisture, the entire surface of the concrete shall be kept damp by applying water with a nozzle that so atomizes the flow that a mist and not a spray is formed, until the surface of the concrete is covered with the curing medium. The moisture from the nozzle shall not be applied under pressure directly upon the concrete and shall not be allowed to accumulate on the concrete in a quantity sufficient to cause a flow or wash the surface. At the expiration of the curing period, the concrete surfaces shall be cleared of all curing media.

At the option of the Contractor, a curing medium consisting of white opaque polyethylene sheeting extruded onto burlap may be used to cure concrete structures. The polyethylene sheeting shall have a minimum thickness of 100  $\mu\text{m}$ , and shall be extruded onto 283.5-gram burlap.

At the option of the Contractor, a curing medium consisting of polyethylene sheeting may be used to cure concrete columns. The polyethylene sheeting shall have a minimum thickness of 250  $\mu\text{m}$  achieved in a single layer of material.

If the Contractor chooses to use polyethylene sheeting or polyethylene sheeting on burlap as a curing medium, these media and any joints therein shall be secured as necessary to provide moisture retention and shall be within 75 mm of the concrete at all points along the surface being cured. When these media are used, the temperature of the concrete shall be monitored during curing. If the temperature of the concrete cannot be maintained below 60°C, use of these curing media shall be disallowed.

When concrete bridge decks and flat slabs are to be cured without the use of a curing medium, the entire surface of the bridge deck or slab shall be kept damp by the application of water with an atomizing nozzle as specified above, until the concrete has set, after which the entire surface of the concrete shall be sprinkled continuously with water for a period of not less than 7 days.

#### **90-7.01B CURING COMPOUND METHOD**

Surfaces of the concrete that are exposed to the air shall be sprayed uniformly with a curing compound.

Curing compounds to be used shall be as follows:

1. Pigmented curing compound conforming to the requirements in ASTM Designation: C 309, Type 2, Class B, except the resin type shall be poly-alpha-methylstyrene.
2. Pigmented curing compound conforming to the requirements in ASTM Designation: C 309, Type 2, Class B.
3. Pigmented curing compound conforming to the requirements in ASTM Designation: C 309, Type 2, Class A.
4. Nonpigmented curing compound conforming to the requirements in ASTM Designation: C 309, Type 1, Class B.
5. Nonpigmented curing compound conforming to the requirements in ASTM Designation: C 309, Type 1, Class A.
6. Nonpigmented curing compound with fugitive dye conforming to the requirements in ASTM Designation: C 309, Type 1-D, Class A.

The infrared scan for the dried vehicle from curing compound (1) shall match the infrared scan on file at the Transportation Laboratory.

The loss of water for each type of curing compound, when tested in conformance with the requirements in California Test 534, shall not be more than 0.15-kg/m<sup>2</sup> in 24 hours.

The curing compound to be used will be specified elsewhere in these specifications or in the special provisions.

If the use of curing compound is required or permitted elsewhere in these specifications or in the special provisions and no specific kind is specified, any of the curing compounds listed above may be used.

Curing compound shall be applied at a nominal rate of 3.7 m<sup>2</sup>/L, unless otherwise specified.

At any point, the application rate shall be within  $\pm 1.2$  m<sup>2</sup>/L of the nominal rate specified, and the average application rate shall be within  $\pm 0.5$  m<sup>2</sup>/L of the nominal rate specified when tested in conformance with the requirements in California Test 535. Runs, sags, thin areas, skips, or holidays in the applied curing compound shall be evidence that the application is not satisfactory.

Curing compounds shall be applied using power operated spray equipment. The power operated spraying equipment shall be equipped with an operational pressure gage and a means of controlling the pressure. Hand spraying of small and irregular areas that are not reasonably accessible to mechanical spraying equipment, in the opinion of the Engineer, may be permitted.

The curing compound shall be applied to the concrete following the surface finishing operation, immediately before the moisture sheen disappears from the surface, but before any drying shrinkage or craze cracks begin to appear. In the event of any drying or cracking of the surface, application of water with an atomizing nozzle as

specified in Section 90-7.01A, "Water Method," shall be started immediately and shall be continued until application of the compound is resumed or started; however, the compound shall not be applied over any resulting freestanding water. Should the film of compound be damaged from any cause before the expiration of 7 days after the concrete is placed in the case of structures and 72 hours in the case of pavement, the damaged portion shall be repaired immediately with additional compound.

At the time of use, compounds containing pigments shall be in a thoroughly mixed condition with the pigment uniformly dispersed throughout the vehicle. A paddle shall be used to loosen all settled pigment from the bottom of the container, and a power driven agitator shall be used to disperse the pigment uniformly throughout the vehicle.

Agitation shall not introduce air or other foreign substance into the curing compound.

The manufacturer shall include in the curing compound the necessary additives for control of sagging, pigment settling, leveling, de-emulsification, or other requisite qualities of a satisfactory working material. Pigmented curing compounds shall be manufactured so that the pigment does not settle badly, does not cake or thicken in the container, and does not become granular or curdled. Settlement of pigment shall be a thoroughly wetted, soft, mushy mass permitting the complete and easy vertical penetration of a paddle. Settled pigment shall be easily redispersed, with minimum resistance to the sideways manual motion of the paddle across the bottom of the container, to form a smooth uniform product of the proper consistency.

Curing compounds shall remain sprayable at temperatures above 4°C and shall not be diluted or altered after manufacture.

The curing compound shall be packaged in clean 1040-L totes, 210-L barrels, or 19-L pails, or shall be supplied from a suitable storage tank located at the job site. The containers shall comply with "Title 49, Code of Federal Regulations, Hazardous Materials Regulations." The 1040-L totes and the 210-L barrels shall have removable lids and airtight fasteners. The 19-L pails shall be round and have standard full open head and bail. Lids with bungholes will not be permitted. Settling or separation of solids in containers, except tanks, must be completely redispersed with low speed mixing prior to use, in conformance with these specifications and the manufacturer's recommendations. Mixing shall be accomplished either manually by use of a paddle or by use of a mixing blade driven by a drill motor, at low speed. Mixing blades shall be the type used for mixing paint. On-site storage tanks shall be kept clean and free of contaminants. Each tank shall have a permanent system designed to completely redisperse settled material without introducing air or other foreign substances.

Steel containers and lids shall be lined with a coating that will prevent destructive action by the compound or chemical agents in the air space above the compound. The coating shall not come off the container or lid as skins. Containers shall be filled in a manner that will prevent skinning. Plastic containers shall not react with the compound.

Each container shall be labeled with the manufacturer's name, kind of curing compound, batch number, volume, date of manufacture, and volatile organic compound (VOC) content. The label shall also warn that the curing compound containing pigment shall be well stirred before use. Precautions concerning the handling and the application of curing compound shall be shown on the label of the curing compound containers in conformance with the Construction Safety Orders and General Industry Safety Orders of the State.

Containers of curing compound shall be labeled to indicate that the contents fully comply with the rules and regulations concerning air pollution control in the State.

When the curing compound is shipped in tanks or tank trucks, a shipping invoice shall accompany each load. The invoice shall contain the same information as that required herein for container labels.

Curing compound will be sampled by the Engineer at the source of supply, at the job site, or at both locations.

Curing compound shall be formulated so as to maintain the specified properties for a minimum of one year. The Engineer may require additional testing before use to determine compliance with these specifications if the compound has not been used within one year or whenever the Engineer has reason to believe the compound is no longer satisfactory.

Tests will be conducted in conformance with the latest ASTM test methods and methods in use by the Transportation Laboratory.

#### **90-7.01C WATERPROOF MEMBRANE METHOD**

The exposed finished surfaces of concrete shall be sprayed with water, using a nozzle that so atomizes the flow that a mist and not a spray is formed, until the concrete has set, after which the curing membrane, shall be placed. The curing membrane shall remain in place for a period of not less than 72 hours.

Sheeting material for curing concrete shall conform to the requirements in AASHTO Designation: M 171 for white reflective materials.

The sheeting material shall be fabricated into sheets of such width as to provide a complete cover for the entire concrete surface. Joints in the sheets shall be securely cemented together in such a manner as to provide a waterproof joint. The joint seams shall have a minimum lap of 100 mm.

The sheets shall be securely weighted down by placing a bank of earth on the edges of the sheets or by other means satisfactory to the Engineer.

Should any portion of the sheets be broken or damaged before the expiration of 72 hours after being placed, the broken or damaged portions shall be immediately repaired with new sheets properly cemented into place.

Sections of membrane that have lost their waterproof qualities or have been damaged to such an extent as to render them unfit for curing the concrete shall not be used.

#### **90-7.01D FORMS-IN-PLACE METHOD**

Formed surfaces of concrete may be cured by retaining the forms in place. The forms shall remain in place for a minimum period of 7 days after the concrete has been placed, except that for members over 0.5-m in least dimension the forms shall remain in place for a minimum period of 5 days.

Joints in the forms and the joints between the end of forms and concrete shall be kept moisture tight during the curing period. Cracks in the forms and cracks between the forms and the concrete shall be resealed by methods subject to the approval of the Engineer.

#### **90-7.02 CURING PAVEMENT**

The entire exposed area of the pavement, including edges, shall be cured by the waterproof membrane method, or curing compound method using curing compound (1) or (2) as the Contractor may elect. Should the side forms be removed before the expiration of 72 hours following the start of curing, the exposed pavement edges shall also be cured. If the pavement is cured by means of the curing compound method, the sawcut and all portions of the curing compound that have been disturbed by sawing operations shall be restored by spraying with additional curing compound.

Curing shall commence as soon as the finishing process provided in Section 40-1.10, "Final Finishing," has been completed. The method selected shall conform to the provisions in Section 90-7.01, "Methods of Curing."

When the curing compound method is used, the compound shall be applied to the entire pavement surface by mechanical sprayers. Spraying equipment shall be of the fully atomizing type equipped with a tank agitator that provides for continual agitation of the curing compound during the time of application. The spray shall be adequately protected against wind, and the nozzles shall be so oriented or moved mechanically transversely as to result in the minimum specified rate of coverage being applied uniformly on exposed faces. Hand spraying of small and irregular areas, and areas inaccessible to mechanical spraying equipment, in the opinion of the Engineer, will be permitted. When the ambient air temperature is above 15°C, the Contractor shall fog the surface of the concrete with a fine spray of water as specified in Section 90-7.01A, "Water Method." The surface of the pavement shall be kept moist between the hours of 10:00 a.m. and 4:30 p.m. on the day the concrete is placed. However, the fogging done after the curing compound has been applied shall not begin until the compound has set sufficiently to prevent displacement. Fogging shall be discontinued if ordered in writing by the Engineer.

#### **90-7.03 CURING STRUCTURES**

Newly placed concrete for cast-in-place structures, other than highway bridge decks, shall be cured by the water method, the forms-in-place method, or, as permitted herein, by the curing compound method, in conformance with the provisions in Section 90-7.01, "Methods of Curing."

The curing compound method using a pigmented curing compound may be used on concrete surfaces of construction joints, surfaces that are to be buried underground, and surfaces where only ordinary surface finish is to be applied and on which a uniform color is not required and that will not be visible from a public traveled way. If the Contractor elects to use the curing compound method on the bottom slab of box girder spans, the curing compound shall be curing compound (1).

The top surface of highway bridge decks shall be cured by both the curing compound method and the water method. The curing compound shall be curing compound (1).

Concrete surfaces of minor structures, as defined in Section 51-1.02, "Minor Structures," shall be cured by the water method, the forms-in-place method or the curing compound method.

When deemed necessary by the Engineer during periods of hot weather, water shall be applied to concrete surfaces being cured by the curing compound method or by the forms-in-place method, until the Engineer determines that a cooling effect is no longer required. Application of water for this purpose will be paid for as extra work as provided in Section 4-1.03D, "Extra Work."

#### **90-7.04 CURING PRECAST CONCRETE MEMBERS**

Precast concrete members shall be cured in conformance with any of the methods specified in Section 90-7.01, "Methods of Curing." Curing shall be provided for the minimum time specified for each method or until the

concrete reaches its design strength, whichever is less. Steam curing may also be used for precast members and shall conform to the following provisions:

- A. After placement of the concrete, members shall be held for a minimum 4-hour presteaming period. If the ambient air temperature is below 10°C, steam shall be applied during the presteaming period to hold the air surrounding the member at a temperature between 10°C and 32°C.
- B. To prevent moisture loss on exposed surfaces during the presteaming period, members shall be covered as soon as possible after casting or the exposed surfaces shall be kept wet by fog spray or wet blankets.
- C. Enclosures for steam curing shall allow free circulation of steam about the member and shall be constructed to contain the live steam with a minimum moisture loss. The use of tarpaulins or similar flexible covers will be permitted, provided they are kept in good repair and secured in such a manner as to prevent the loss of steam and moisture.
- D. Steam at the jets shall be at low pressure and in a saturated condition. Steam jets shall not impinge directly on the concrete, test cylinders, or forms. During application of the steam, the temperature rise within the enclosure shall not exceed 22°C per hour. The curing temperature throughout the enclosure shall not exceed 65°C and shall be maintained at a constant level for a sufficient time necessary to develop the required transfer strength. Control cylinders shall be covered to prevent moisture loss and shall be placed in a location where temperature is representative of the average temperature of the enclosure.
- E. Temperature recording devices that will provide an accurate, continuous, permanent record of the curing temperature shall be provided. A minimum of one temperature recording device per 60 m of continuous bed length will be required for checking temperature.
- F. Members in pretension beds shall be detensioned immediately after the termination of steam curing while the concrete and forms are still warm, or the temperature under the enclosure shall be maintained above 15°C until the stress is transferred to the concrete.
- G. Curing of precast concrete will be considered completed after termination of the steam curing cycle.

#### **90-7.05 CURING PRECAST PRESTRESSED CONCRETE PILES**

Newly placed concrete for precast prestressed concrete piles shall be cured in conformance with the provisions in Section 90-7.04, "Curing Precast Concrete Members," except that piles in a corrosive environment shall be cured as follows:

- A. Piles shall be either steam cured or water cured. If water curing is used, the piles shall be kept continuously wet by the application of water in conformance with the provisions in Section 90-7.01A, "Water Method."
- B. If steam curing is used, the steam curing provisions in Section 90-7.04, "Curing Precast Concrete Members," shall apply except that the piles shall be kept continuously wet for their entire length for a period of not less than 3 days, including the holding and steam curing periods.

#### **90-7.06 CURING SLOPE PROTECTION**

Concrete slope protection shall be cured in conformance with any of the methods specified in Section 90-7.01, "Methods of Curing."

Concreted-rock slope protection shall be cured in conformance with any of the methods specified in Section 90-7.01, "Methods of Curing," with a blanket of earth kept wet for 72 hours, or by sprinkling with a fine spray of water every 2 hours during the daytime for a period of 3 days.

#### **90-7.07 CURING MISCELLANEOUS CONCRETE WORK**

Exposed surfaces of curbs shall be cured by pigmented curing compounds as specified in Section 90-7.01B, "Curing Compound Method."

Concrete sidewalks, gutter depressions, island paving, curb ramps, driveways, and other miscellaneous concrete areas shall be cured in conformance with any of the methods specified in Section 90-7.01, "Methods of Curing."

Shotcrete shall be cured for at least 72 hours by spraying with water, by a moist earth blanket, or by any of the methods provided in Section 90-7.01, "Methods of Curing."

Mortar and grout shall be cured by keeping the surface damp for 3 days.

After placing, the exposed surfaces of sign structure foundations, including pedestal portions, if constructed, shall be cured for at least 72 hours by spraying with water, by a moist earth blanket, or by any of the methods provided in Section 90-7.01, "Methods of Curing."

## **90-8 PROTECTING CONCRETE**

### **90-8.01 GENERAL**

In addition to the provisions in Section 7-1.16, "Contractor's Responsibility for the Work and Materials," the Contractor shall protect concrete as provided in this Section 90-8. If required by the Engineer, the Contractor shall submit a written outline of the proposed methods for protecting the concrete.

The Contractor shall protect concrete from damage from any cause, which shall include, but not be limited to: rain, heat, cold, wind, Contractor's actions, and actions of others.

Concrete shall not be placed on frozen or ice-coated ground or subgrade nor on ice-coated forms, reinforcing steel, structural steel, conduits, precast members, or construction joints.

Under rainy conditions, placing of concrete shall be stopped before the quantity of surface water is sufficient to damage surface mortar or cause a flow or wash of the concrete surface, unless the Contractor provides adequate protection against damage.

Concrete that has been frozen or damaged by other causes, as determined by the Engineer, shall be removed and replaced by the Contractor at the Contractor's expense.

### **90-8.02 PROTECTING CONCRETE STRUCTURES**

Structure concrete and shotcrete used as structure concrete shall be maintained at a temperature of not less than 7°C for 72 hours after placing and at not less than 4°C for an additional 4 days.

### **90-8.03 PROTECTING CONCRETE PAVEMENT**

Pavement concrete shall be maintained at a temperature of not less than 4°C for 72 hours.

Except as provided in Section 7-1.08, "Public Convenience," the Contractor shall protect concrete pavement against construction and other activities that abrade, scar, discolor, reduce texture depth, lower coefficient of friction, or otherwise damage the surface. Stockpiling, drifting, or excessive spillage of soil, gravel, petroleum products, and concrete or asphalt mixes on the surface of concrete pavement is prohibited unless otherwise specified in these specifications, the special provisions or permitted by the Engineer.

If ordered by the Engineer or shown on the plans or specified in the special provisions, pavement crossings shall be constructed for the convenience of public traffic. The material and work necessary for the construction of the crossings, and their subsequent removal and disposal, will be paid for at the contract unit prices for the items of work involved and if there are no contract items for the work involved, payment for pavement crossings will be made by extra work as provided in Section 4-1.03D, "Extra Work." Where public traffic will be required to cross over the new pavement, Type III portland cement may be used in concrete, if permitted in writing by the Engineer. The pavement may be opened to traffic as soon as the concrete has developed a modulus of rupture of 3.8 MPa. The modulus of rupture will be determined by California Test 523.

No traffic or Contractor's equipment, except as hereinafter provided, will be permitted on the pavement before a period of 10 days has elapsed after the concrete has been placed, nor before the concrete has developed a modulus of rupture of at least 3.8 MPa. Concrete that fails to attain a modulus of rupture of 3.8 MPa within 10 days shall not be opened to traffic until directed by the Engineer.

Equipment for sawing weakened plane joints will be permitted on the pavement as specified in Section 40-1.08B, "Weakened Plane Joints."

When requested in writing by the Contractor, the tracks on one side of paving equipment will be permitted on the pavement after a modulus of rupture of 2.4 MPa has been attained, provided that:

- A. Unit pressure exerted on the pavement by the paver shall not exceed 135 kPa;
- B. Tracks with cleats, grousers, or similar protuberances shall be modified or shall travel on planks or equivalent protective material, so that the pavement is not damaged; and
- C. No part of the track shall be closer than 0.3-m from the edge of pavement.

In case of visible cracking of, or other damage to the pavement, operation of the paving equipment on the pavement shall be immediately discontinued.

Damage to the pavement resulting from early use of pavement by the Contractor's equipment as provided above shall be repaired by the Contractor.

The State will furnish the molds and machines for testing the concrete for modulus of rupture, and the Contractor, at the Contractor's expense, shall furnish the material and whatever labor the Engineer may require.

## 90-9 COMPRESSIVE STRENGTH

### 90-9.01 GENERAL

Concrete compressive strength requirements consist of a minimum strength that shall be attained before various loads or stresses are applied to the concrete and, for concrete designated by strength, a minimum strength at the age of 28 days or at the age otherwise allowed in Section 90-1.01, "Description." The various strengths required are specified in these specifications or the special provisions or are shown on the plans.

The compressive strength of concrete will be determined from test cylinders that have been fabricated from concrete sampled in conformance with the requirements of California Test 539. Test cylinders will be molded and initially field cured in conformance with California Test 540. Test cylinders will be cured and tested after receipt at the testing laboratory in conformance with the requirements of California Test 521. A strength test shall consist of the average strength of 2 cylinders fabricated from material taken from a single load of concrete, except that, if any cylinder should show evidence of improper sampling, molding, or testing, that cylinder shall be discarded and the strength test shall consist of the strength of the remaining cylinder.

When concrete compressive strength is specified as a prerequisite to applying loads or stresses to a concrete structure or member, test cylinders for other than steam cured concrete will be cured in conformance with Method 1 of California Test 540. The compressive strength of concrete determined for these purposes will be evaluated on the basis of individual tests.

When concrete is designated by 28-day compressive strength rather than by cementitious material content, the concrete strength to be used as a basis for acceptance of other than steam cured concrete will be determined from cylinders cured in conformance with Method 1 of California Test 540. If the result of a single compressive strength test at the maximum age specified or allowed is below the specified strength but is 95 percent or more of the specified strength, the Contractor shall make corrective changes, subject to approval of the Engineer, in the mix proportions or in the concrete fabrication procedures, before placing additional concrete, and shall pay to the State \$14 for each in-place cubic meter of concrete represented by the deficient test. If the result of a single compressive strength test at the maximum age specified or allowed is below 95 percent of the specified strength, but is 85 percent or more of the specified strength, the Contractor shall make the corrective changes specified above, and shall pay to the State \$20 for each in place cubic meter of concrete represented by the deficient test. In addition, such corrective changes shall be made when the compressive strength of concrete tested at 7 days indicates, in the judgment of the Engineer, that the concrete will not attain the required compressive strength at the maximum age specified or allowed. Concrete represented by a single test that indicates a compressive strength of less than 85 percent of the specified 28-day compressive strength will be rejected in conformance with the provisions in Section 6-1.04, "Defective Materials."

If the test result indicates that the compressive strength at the maximum curing age specified or allowed is below the specified strength, but is 85 percent or more of the specified strength, payments to the State as required above shall be made, unless the Contractor, at the Contractor's expense, obtains and submits evidence acceptable to the Engineer that the strength of the concrete placed in the work meets or exceeds the specified 28-day compressive strength. If the test result indicates a compressive strength at the maximum curing age specified or allowed below 85 percent, the concrete represented by that test will be rejected, unless the Contractor, at the Contractor's expense, obtains and submits evidence acceptable to the Engineer that the strength and quality of the concrete placed in the work are acceptable. If the evidence consists of tests made on cores taken from the work, the cores shall be obtained and tested in conformance with the requirements in ASTM Designation: C 42.

No single compressive strength test shall represent more than 250 m<sup>3</sup>.

If a precast concrete member is steam cured, the compressive strength of the concrete will be determined from test cylinders that have been handled and stored in conformance with Method 3 of California Test 540. The compressive strength of steam cured concrete will be evaluated on the basis of individual tests representing specific portions of production. If the concrete is designated by 28-day compressive strength rather than by cementitious material content, the concrete shall be considered to be acceptable whenever its compressive strength reaches the specified 28-day compressive strength provided that strength is reached in not more than the maximum number of days specified or allowed after the member is cast.

When concrete is specified by compressive strength, prequalification of materials, mix proportions, mixing equipment, and procedures proposed for use will be required prior to placement of the concrete. Prequalification shall be accomplished by the submission of acceptable certified test data or trial batch reports by the Contractor. Prequalification data shall be based on the use of materials, mix proportions, mixing equipment, procedures, and size of batch proposed for use in the work.

Certified test data, in order to be acceptable, shall indicate that not less than 90 percent of at least 20 consecutive tests exceed the specified strength at the maximum number of cure days specified or allowed, and none of those tests are less than 95 percent of specified strength. Strength tests included in the data shall be the most



recent tests made on concrete of the proposed mix design and all shall have been made within one year of the proposed use of the concrete.

Trial batch test reports, in order to be acceptable, shall indicate that the average compressive strength of 5 consecutive concrete cylinders, taken from a single batch, at not more than 28 days (or the maximum age allowed) after molding shall be at least 4 MPa greater than the specified 28-day compressive strength, and no individual cylinder shall have a strength less than the specified strength at the maximum age specified or allowed. Data contained in the report shall be from trial batches that were produced within one year of the proposed use of specified strength concrete in the project. Whenever air-entrainment is required, the air content of trial batches shall be equal to or greater than the air content specified for the concrete without reduction due to tolerances.

Tests shall be performed in conformance with either the appropriate California Test methods or the comparable ASTM test methods. Equipment employed in testing shall be in good condition and shall be properly calibrated. If the tests are performed during the life of the contract, the Engineer shall be notified sufficiently in advance of performing the tests in order to witness the test procedures.

The certified test data and trial batch test reports shall include the following information:

- A. Date of mixing.
- B. Mixing equipment and procedures used.
- C. The size of batch in cubic meters and the mass, type, and source of all ingredients used.
- D. Penetration or slump (if the concrete will be placed under water or placed in cast-in-place concrete piles) of the concrete.
- E. The air content of the concrete if an air-entraining admixture is used.
- F. The age at time of testing and strength of all concrete cylinders tested.

Certified test data and trial batch test reports shall be signed by an official of the firm that performed the tests.

When approved by the Engineer, concrete from trial batches may be used in the work at locations where concrete of a lower quality is required and the concrete will be paid for as the type or class of concrete required at that location.

After materials, mix proportions, mixing equipment, and procedures for concrete have been prequalified for use, additional prequalification by testing of trial batches will be required prior to making changes that, in the judgment of the Engineer, could result in a strength of concrete below that specified.

The Contractor's attention is directed to the time required to test trial batches and the Contractor shall be responsible for production of trial batches at a sufficiently early date so that the progress of the work is not delayed.

When precast concrete members are manufactured at the plant of an established manufacturer of precast concrete members, the mix proportions of the concrete shall be determined by the Contractor, and a trial batch and prequalification of the materials, mix proportions, mixing equipment, and procedures will not be required.

## **90-10 MINOR CONCRETE**

### **90-10.01 GENERAL**

Concrete for minor structures, slope paving, curbs, sidewalks and other concrete work, when designated as minor concrete on the plans, in the specifications, or in the contract item, shall conform to the provisions specified herein.

The Engineer, at the Engineer's discretion, will inspect and test the facilities, materials and methods for producing the concrete to ensure that minor concrete of the quality suitable for use in the work is obtained.

### **90-10.02 MATERIALS**

Minor concrete shall conform to the following requirements:

#### **90-10.02A CEMENTITIOUS MATERIAL**

Cementitious material shall conform to the provisions in Section 90-1.01, "Description."

#### **90-10.02B AGGREGATE**

Aggregate shall be clean and free from deleterious coatings, clay balls, roots, and other extraneous materials.

Use of crushed concrete or reclaimed aggregate is acceptable only if the aggregate satisfies all aggregate requirements.

The Contractor shall submit to the Engineer for approval, a grading of the combined aggregate proposed for use in the minor concrete. After acceptance of the grading, aggregate furnished for minor concrete shall conform to that grading, unless a change is authorized in writing by the Engineer.

The Engineer may require the Contractor to furnish periodic test reports of the aggregate grading furnished. The maximum size of aggregate used shall be at the option of the Contractor, but in no case shall the maximum size be larger than 37.5 mm or smaller than 19 mm.

The Engineer may waive, in writing, the gradation requirements in this Section 90-10.02B, if, in the Engineer's opinion, the furnishing of the gradation is not necessary for the type or amount of concrete work to be constructed.

#### **90-10.02C WATER**

Water used for washing, mixing, and curing shall be free from oil, salts, and other impurities that would discolor or etch the surface or have an adverse affect on the quality of the concrete.

#### **90-10.02D ADMIXTURES**

The use of admixtures shall conform to the provisions in Section 90-4, "Admixtures."

### **90-10.03 PRODUCTION**

Cementitious material, water, aggregate, and admixtures shall be stored, proportioned, mixed, transported, and discharged in conformance with recognized standards of good practice that will result in concrete that is thoroughly and uniformly mixed, that is suitable for the use intended, and that conforms to requirements specified herein. Recognized standards of good practice are outlined in various industry publications such as are issued by American Concrete Institute, AASHTO, or the Department.

The cementitious material content of minor concrete shall conform to the provisions in Section 90-1.01, "Description."

The amount of water used shall result in a consistency of concrete conforming to the provisions in Section 90-6.06, "Amount of Water and Penetration." Additional mixing water shall not be incorporated into the concrete during hauling or after arrival at the delivery point, unless authorized by the Engineer.

Discharge of ready-mixed concrete from the transporting vehicle shall be made while the concrete is still plastic and before stiffening occurs. An elapsed time of 1.5 hours (one hour in nonagitating hauling equipment), or more than 250 revolutions of the drum or blades, after the introduction of the cementitious material to the aggregates, or a temperature of concrete of more than 32°C will be considered conditions contributing to the quick stiffening of concrete. The Contractor shall take whatever action is necessary to eliminate quick stiffening, except that the addition of water will not be permitted.

The required mixing time in stationary mixers shall be not less than 50 seconds or more than 5 minutes.

The minimum required revolutions at mixing speed for transit-mixed concrete shall be not less than that recommended by the mixer manufacturer, and shall be increased, if necessary, to produce thoroughly and uniformly mixed concrete.

When a high range water-reducing admixture is added to the concrete at the job site, the total number of revolutions shall not exceed 300.

Each load of ready-mixed concrete shall be accompanied by a weighmaster certificate that shall be delivered to the Engineer at the discharge location of the concrete, unless otherwise directed by the Engineer. The weighmaster certificate shall be clearly marked with the date and time of day when the load left the batching plant and, if hauled in truck mixers or agitators, the time the mixing cycle started.

A Certificate of Compliance conforming to the provisions in Section 6-1.07, "Certificates of Compliance," shall be furnished to the Engineer, prior to placing minor concrete from a source not previously used on the contract, stating that minor concrete to be furnished meets contract requirements, including minimum cementitious material content specified.

### **90-10.04 CURING MINOR CONCRETE**

Curing minor concrete shall conform to the provisions in Section 90-7, "Curing Concrete."

### **90-10.05 PROTECTING MINOR CONCRETE**

Protecting minor concrete shall conform to the provisions in Section 90-8, "Protecting Concrete," except the concrete shall be maintained at a temperature of not less than 4°C for 72 hours after placing.

### **90-10.06 MEASUREMENT AND PAYMENT**

Minor concrete will be measured and paid for in conformance with the provisions specified in the various sections of these specifications covering concrete construction when minor concrete is specified in the specifications, shown on the plans, or indicated by contract item in the Engineer's Estimate.

## 90-11.01 MEASUREMENT

For concrete measured at the mixer, the volume in cubic meters shall be computed as the total mass of the batch in kilograms divided by the density of the concrete in kilograms per cubic meter. The total mass of the batch shall be calculated as the sum of all materials, including water, entering the batch. The density of the concrete will be determined in conformance with the requirements in California Test 518.

Should the Contractor use admixtures in conformance with the provisions in Section 90-4.05, "Optional Use of Chemical Admixtures," or Section 90-4.07, "Optional Use of Air-entraining Admixtures," or should the Contractor request and obtain permission to use other admixtures for the Contractor's benefit, the Contractor shall furnish those admixtures and incorporate them into the concrete at the Contractor's expense and no additional compensation will be allowed therefor.

Contract No. 04-0120T4  
211 of 220

**Replace Section 91-4 with:**  
**91-4 MISCELLANEOUS PAINTS**

**91-4.01 THROUGH 91-4.04 (BLANK)**

**91-4.05 PAINT; ACRYLIC EMULSION, EXTERIOR WHITE AND LIGHT AND MEDIUM TINTS**

**Performance Graded Asphalt Binder**

Property	AASHTO Test Method	Specification				
		Grade				
		PG 58-22 <sup>a</sup>	PG 64-10	PG 64-16	PG 64-28	PG 70-10
Original Binder						
Flash Point, Minimum °C	T 48	230	230	230	230	230
Solubility, Minimum % <sup>b</sup>	T 44	99	99	99	99	99
Viscosity at 135°C, <sup>c</sup> Maximum, Pa·s	T 316	3.0	3.0	3.0	3.0	3.0
Dynamic Shear, Test Temp. at 10 rad/s, °C Minimum G*/sin(delta), kPa	T 315	58 1.00	64 1.00	64 1.00	64 1.00	70 1.00
RTFO Test, <sup>e</sup> Mass Loss, Maximum, %	T 240	1.00	1.00	1.00	1.00	1.00
RTFO Test Aged Binder						
Dynamic Shear, Test Temp. at 10 rad/s, °C Minimum G*/sin(delta), kPa	T 315	58 2.20	64 2.20	64 2.20	64 2.20	70 2.20
Ductility at 25°C Minimum, cm	T 51	75	75	75	75	75
PAV <sup>f</sup> Aging, Temperature, °C	R 28	100	100	100	100	110
RTFO Test and PAV Aged Binder						
Dynamic Shear, Test Temp. at 10 rad/s, °C Maximum G*sin(delta), kPa	T 315	22 <sup>d</sup> 5000	31 <sup>d</sup> 5000	28 <sup>d</sup> 5000	22 <sup>d</sup> 5000	34 <sup>d</sup> 5000
Creep Stiffness, Test Temperature, °C Maximum S-value, Mpa Minimum M-value	T 313	-12 300 0.300	0 300 0.300	-6 300 0.300	-18 300 0.300	0 300 0.300

**Notes:**

- Use as asphalt rubber base stock for high mountain and high desert area.
- The Engineer waives this specification if the supplier is a Quality Supplier as defined by the Department's "Certification Program for Suppliers of Asphalt."
- The Engineer waives this specification if the supplier certifies the asphalt binder can be adequately pumped and mixed at temperatures meeting applicable safety standards.
- Test the sample at 3°C higher if it fails at the specified test temperature. G\*/sin(delta) remains 5000 kPa maximum.
- "RTFO Test" means the asphaltic residue obtained using the Rolling Thin Film Oven Test, AASHTO Test Method T 240 or ASTM Designation: D 2872. The residue from mass change determination may be used for other tests.
- "PAV" means Pressurized Aging Vessel.

Performance graded polymer modified asphalt binder (PG Polymer Modified) is:

**Performance Graded Polymer Modified Asphalt Binder <sup>a</sup>**

Property	AASHTO Test Method	Specification Grade		
		PG 58-34 PM	PG 64-28 PM	PG 76-22 PM
Original Binder				
Flash Point, Minimum °C	T 48	230	230	230
Solubility, Minimum % <sup>b</sup>	T 44 <sup>c</sup>	98.5	98.5	98.5
Viscosity at 135°C, <sup>d</sup> Maximum, Pa·s	T 316	3.0	3.0	3.0
Dynamic Shear, Test Temp. at 10 rad/s, °C Minimum G*/sin(delta), kPa	T 315	58 1.00	64 1.00	76 1.00
RTFO Test , Mass Loss, Maximum, %	T 240	1.00	1.00	1.00
RTFO Test Aged Binder				
Dynamic Shear, Test Temp. at 10 rad/s, °C Minimum G*/sin(delta), kPa	T 315	58 2.20	64 2.20	76 2.20
Dynamic Shear, Test Temp. at 10 rad/s, °C Maximum (delta), %	T 315	Note e 80	Note e 80	Note e 80
Elastic Recovery <sup>f</sup> , Test Temp., °C Minimum recovery, %	T 301	25 75	25 75	25 65
PAV <sup>g</sup> Aging, Temperature, °C	R 28	100	100	110
RTFO Test and PAV Aged Binder				
Dynamic Shear, Test Temp. at 10 rad/s, °C Maximum G*sin(delta), kPa	T 315	16 5000	22 5000	31 5000
Creep Stiffness, Test Temperature, °C Maximum S-value, MPa Minimum M-value	T 313	-24 300 0.300	-18 300 0.300	-12 300 0.300

**Notes:**

- Do not modify PG Polymer Modified using acid modification.
- The Engineer waives this specification if the supplier is a Quality Supplier as defined by the Department's "Certification Program for Suppliers of Asphalt."
- The Department allows ASTM D 5546 instead of AASHTO T 44
- The Engineer waives this specification if the supplier certifies the asphalt binder can be adequately pumped and mixed at temperatures meeting applicable safety standards.
- Test temperature is the temperature at which G\*/sin(delta) is 2.2 kPa. A graph of log G\*/sin(delta) plotted against temperature may be used to determine the test temperature when G\*/sin(delta) is 2.2 kPa. A graph of (delta) versus temperature may be used to determine delta at the temperature when G\*/sin(delta) is 2.2 kPa. The Engineer also accepts direct measurement of (delta) at the temperature when G\*/sin(delta) is 2.2 kPa.
- Tests without a force ductility clamp may be performed.
- "PAV" means Pressurized Aging Vessel.

**SAMPLING**

Provide a sampling device in the asphalt feed line connecting the plant storage tanks to the asphalt weighing system or spray bar. Make the sampling device accessible between 600 and 750 mm above the platform. Provide a receptacle for flushing the sampling device.

Include with the sampling device a valve:

- Between 10 and 20 mm in diameter
- Manufactured in a manner that a one-liter sample may be taken slowly at any time during plant operations



**Replace Section 95 with:**

**SECTION 95 EPOXY**

**95-1 GENERAL**

**95-1.01 DESCRIPTION**

These specifications are intended to specify epoxy that will meet service requirements for highway construction.

Epoxy shall be furnished as 2 components, which shall be mixed together at the site of the work.

**95-1.02 SAMPLING AND TESTING**

Epoxy shall not be used prior to sampling and testing unless its use is permitted prior to sampling and testing in conformance with the provisions in Section 6-1.07, "Certificates of Compliance."

Tests will be conducted in conformance with the latest test methods of the American Society for Testing and Materials, and California Test Methods in use by the Transportation Laboratory.

Epoxy components shall be formulated to maintain the specified properties for a minimum of one year. The Engineer may require additional testing of any epoxy component that has not been used within one year of manufacture.

**95-1.03 PACKAGING, LABELING AND STORING**

Each component shall be packaged in containers of size proportional to the amount of that component in the mix so that one container of each component is used in mixing one batch of epoxy. The containers shall be of such design that all of the contents may be readily removed and shall be well sealed to prevent leakage. The containers and labeling shall meet U.S. Department of Transportation Hazardous Material Shipping Regulations, and the containers shall be of a material, or lined with a material, of such character as to resist any action by the components. Each container shall be clearly labeled with the ASTM Designation: C881 Class and Type; designation (Component A or B); manufacturer's name; date of manufacture; batch number (a batch shall consist of a single charge of all components in a mixing chamber); all directions for use (as specified elsewhere) and such warning or precautions concerning the contents as may be required by State or Federal Laws and Regulations. The manufacturer of the finished epoxy components shall furnish a Certificate of Compliance in conformance with the provisions in Section 6-1.07, "Certificates of Compliance," and a copy of the label for each material. The certificate shall include a list, by Title and Section, of the State and Federal packaging and labeling laws and regulations that the manufacturer has complied with.

Attention is directed to the characteristic of some epoxy components to crystallize or thicken excessively prior to use when stored at temperatures below 2°C. Any material which shows evidence of crystallization or a permanent increase in viscosity or settling of pigments which cannot be readily redispersed with a paddle shall not be used.

**95-1.04 DIRECTIONS FOR USE**

At the time of mixing, components A and B shall be at a temperature between 15°C and 30°C, unless otherwise specified. Any heating of the adhesive components shall be done by application of indirect heat. Immediately prior to mixing, each component shall be thoroughly mixed with a paddle. Separate paddles shall be used to stir each component. Immediately prior to use, the 2 components shall be thoroughly mixed together in the specified ratios. No solvent shall be added to any epoxy.

After mixing, epoxies shall be placed in the work and any overlaying or inserted material which is to be bonded to the work by the epoxy shall also be placed before thickening of the epoxy has begun. Surfaces upon which epoxy is to be placed shall be free of rust, paint, grease, asphalt, and loose and deleterious material. When epoxy is used as a binder to make epoxy concrete or mortar, the 2 components of epoxy shall be thoroughly mixed together before the aggregate is added and, unless otherwise specified, the mix proportions shall consist of one part of binder to approximately 4 parts of aggregate, by volume. Aggregate for use in epoxy concrete and mortar shall be clean and shall have a moisture content of not more than 0.50-percent when tested by California Test 226. Surfaces against which epoxy concrete and mortar are to be placed shall be primed with a coat of the epoxy used just prior to placing the concrete or mortar.

**95-2 TYPES OF EPOXIES**



## **95-2.01 BINDER (ADHESIVE), EPOXY RESIN BASE**

### **Classification:**

This specification covers a low viscosity epoxy formulated primarily for use in making high-strength epoxy concrete and epoxy mortar and in pressure grouting of cracks in concrete. For load bearing applications, use ASTM Designation: C 881, Type IV, Grade 1, Class B or C. Class B or C shall be used depending on the substrate and ambient temperatures. Use Grade B for atmospheric and surface temperatures as low as 4°C. Use Class C when temperatures are 15°C or higher. For non-load bearing applications use ASTM Designation: C881, Type I, Grade 1, Class B or C. Apply no thicker than recommended by the manufacturer. Thick sections of this epoxy are not suitable for use in freeze thaw environments. In a freeze-thaw environment, increase the aggregate loading to improve the properties of the epoxy concrete.

### **Directions for Use:**

Mix in conformance with the manufacturer's written recommendations. No more material shall be mixed than can be used within the pot-life from the time mixing operations are started.

## **95-2.02 (BLANK)**

## **95-2.03 EPOXY RESIN ADHESIVE FOR BONDING NEW CONCRETE TO OLD CONCRETE**

### **Classification:**

This specification covers a low viscosity paste epoxy formulated primarily for use in bonding new portland cement concrete to hardened portland cement concrete. The epoxy shall meet the specification requirements of ASTM Designation: C 881, Type V, Grade 2. This epoxy is available in 2 Classes: Class C for general use at temperature greater than 15°C and Class B for use when cure temperatures are below 15°C and above 4°C, or when a faster cure is required.

### **Directions for Use:**

The mixing ratio and use shall be in conformance with the manufacturer's written recommendations. When measuring as individual Components A and B, stir and tap the measuring containers to remove possible air voids. The ingredients in Components A and B shall be thoroughly dispersed such that each component forms a uniform paste. Do not mix more material than can be spread within the pot life from the time mixing operations are started. The spreading rate shall be sufficient to thoroughly coat the surface. Spread the mixed adhesive by brush or roller over blast-cleaned concrete at a rate recommended by the manufacturer. The new concrete shall be placed against the adhesive coating on the old concrete before the adhesive has set. If the adhesive has set and is not tacky prior to placing the new concrete, a new coating of adhesive shall be applied.

## **95-2.04 RAPID SET EPOXY ADHESIVE FOR PAVEMENT MARKERS**

### **Classification:**

This specification covers a high viscosity paste, rapid set epoxy formulated primarily for use in bonding pavement markers to portland cement concrete and asphalt concrete. The adhesive shall meet ASTM Designation: C 881, Type IV, Grade 3, Class B and C except that the gel time may be shorter than 30 minutes. The adhesive shall conform to these requirements and the following.

### **Characteristics of Combined Components:**

All tests shall be performed in conformance with the requirements in California Test 434.

Property	Requirement
Gel time, minutes, maximum, at 25°C	30
Bond Strength to Concrete, Time, minutes (maximum) to reach not less than 1.4 MPa	
at 25°C ±1°C	35
at 10°C ±1°C	45
Slant Shear Strength	
2 days at 25°C ±1°C, MPa	7
14 days at 25°C ±1°C, plus water soak, MPa	10.5
Tensile Adhesion and Cohesion	
Ceramic marker bottom, MPa	4.8 min.
Ceramic marker bottom, including post cure, MPa	4.8 min.
Retroreflective pavement marker bottom, MPa	3.4 min.
Color of mixed epoxy	gray
Glass transition temperature, T <sub>g</sub> , samples conditioned at 25°C for 24 hours, ASTM Designation: D 4065	30°C min.

**Directions for Use:**

Components A and B shall be mixed in conformance with the manufacturer's written recommendations. When an automatic proportioning and mixing machine is used, the temperature of the components shall be maintained by indirect heating or cooling, so that the adhesive will meter, mix and extrude properly. The maximum temperature shall be such that after proper mixing no excess adhesive shall flow from under the marker other than that specified in Section 85-1.06, "Placement."

**95-2.05 STANDARD SET EPOXY ADHESIVE FOR PAVEMENT MARKERS**

**Classification:**

This specification covers a high viscosity paste standard set epoxy formulated primarily for use in bonding pavement markers to portland cement concrete and asphalt concrete. The epoxy shall meet ASTM Designation: C 881, Type IV, Viscosity Grade 3, Classes B or C, except that the gel time may be shorter than 30 minutes.

**Characteristics of Combined Components:**

All tests shall be performed in conformance with the requirements in California Test 434.

Property	Requirement
Gel time, minutes, maximum, at 25°C	30
Bond Strength to Concrete, Time (maximum) to reach not less than 1.4 MPa	
at 25°C ±1°C	3.5 hours
at 13°C ±1°C	24 hours
Slant Shear Strength	
2 days at 25°C ±1°C, MPa	7 min.
14 days at 25°C ±1°C, plus water soak, MPa	10.5 min.
Tensile Adhesion and Cohesion	
Ceramic marker bottom, MPa	4.8 min.
Ceramic marker bottom, including post cure, MPa	4.8 min.
Reflective pavement marker bottom, MPa	3.4 min.
Color of Mixed Components	gray
Glass transition temperature, T <sub>g</sub> , samples conditioned at 25°C for 24 hours, ASTM Designation: D 4065	30°C min.

**Directions for Use:**

Components A and B shall be mixed in conformance with the manufacturer's written recommendations. When an automatic proportioning and mixing machine is used, the temperature of the components shall be maintained by indirect heating or cooling, so that the adhesive will meter, mix and extrude properly. The maximum temperature shall be such that after proper mixing no excess adhesive shall flow from under the marker other than that specified in Section 85-1.06, "Placement."

**95-2.06 (BLANK)****95-2.07 (BLANK)****95-2.08 (BLANK)****95-2.09 EPOXY SEALANT FOR INDUCTIVE LOOPS****Classification:**

This specification covers a high viscosity liquid epoxy formulated primarily for use in sealing inductive wire loops and leads imbedded in asphalt concrete and portland cement concrete for traffic signal controls and vehicle counters. This epoxy is to be used for repair work on existing spalls, cracks and other deformations in and around saw cuts housing inductor loops and leads. The rapid cure allows minimum traffic delay. This sealant is suitable for use in freeze-thaw areas. The epoxy shall meet ASTM Designation: C 881, Type I, Grade 2 and the following requirements.

**Characteristics of Combined Components:**

All tests shall be performed in conformance with the requirements in California Test 434.

Property	Requirement
Gel time, minutes, maximum	30
On 3-mm cast sheet, cured 18 hours at 25°C, + 5 hours at 70°C	
Tensile Strength, MPa	2.7 min.
Elongation, percent	90 min.
Shore D Hardness	45 min.

**Directions for Use:**

Saw cuts shall be cleaned with compressed air to remove all excess moisture and debris. For repairing damaged saw cuts, all loose spalled material shall be cleaned away from the saw cut, chipping back to sound asphalt concrete or portland cement concrete and all loose material cleaned from loop wires.

The mixing ratio shall be in conformance with the manufacturer's recommendations. No more material shall be mixed than can be used within the gel time from the time mixing operations are started.

When automatic mixing equipment is used for mixing the sealant, the provisions in the twelfth paragraph in Section 85-1.06, "Placement," shall apply.

**95-2.10 (BLANK)****95-2.11 EPOXY RESIN ADHESIVE FOR INJECTION GROUTING OF PORTLAND CEMENT CONCRETE PAVEMENTS****Directions for Use:**

Both components and the mixed material shall contain no solvents. The mixing ratio of the components in terms of volume and mass shall be clearly stated. The material shall be suitable for use in the mixing equipment used by the applicator. Epoxy adhesive samples shall be furnished to the Engineer for testing at least 12 days before the expected time of use.

**Characteristics of Adhesive:**

Test <sup>a</sup>	California Test	Requirement
Brookfield Viscosity, No. 3 Spindle at 20 rpm, Pa·s at 25°C	434, Part 4	0.9 max.
Gel time, minutes	434, Part 1	2 to 15
Slant Shear Strength on Dry Concrete, MPa, after 4 days of cure in air at 25°C ±1°C	434, Part 5 <sup>b</sup>	41.4 min.
Slant Shear Strength on Wet Concrete, MPa, after 4 days of cure in air at 25°C ±1°C	434, Part 5 <sup>b</sup>	21.1 min.
Tensile Strength, Mpa	434, Part 7, except test after 4 days of cure at 25°C ±1°C	31.0 min.
Elongation, %	434, Part 7, except test after 4 days of cure at 25°C ±1°C	10 max.

a The mixing ratio used will be that recommended by the manufacturer.

b For slant shear strength on concrete, delete Sections B-1 and B-5 of California Test 434, Part 5. For dry concrete, use Step "2" below only. For wet concrete, use both Steps "1" & "2":

1 Soak blocks in water for 24 hours at 25°C ±1°C. Remove and wipe off excess water.

2 Mix epoxy as described in California Test 434, Part 1, and apply a coat approximately 250 µm thick to each diagonal surface. Place four 3-mm square pieces of shim stock 305 µm thick on one block to control final film thickness. Before pressing the coated surfaces together, leave the blocks so that the coated surfaces are horizontal until the epoxy reacts slightly to prevent excessive flow.

**END OF AMENDMENTS**